1977

Annual Report of the Clemson Board of Trustees, 1976-1977

Clemson University, Board of Trustees

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Because of one man’s dream of a better life for South Carolinians, Clemson University was established to respond to people’s needs. Throughout its 84 years of service to the State and nation, Clemson has remained a “people oriented” institution. Its teaching, research and public service activities touch people’s lives every day.

As a state land-grant institution, Clemson’s earliest commitments were to the “study of agriculture and natural science,” and later to the expansion of industrial growth. These early commitments continue, but they expand as mankind’s needs change. Today, Clemson is responding to a wide range of problems affecting South Carolinians and people everywhere: developing new food sources and better food production and delivery systems; seeking a safer, better quality environment; improving health care delivery; creating innovative education programs; developing new industrial technology; broadening recreational and other opportunities for self-enrichment; and seeking to improve man’s other basic needs, clothing and shelter.

Through these and other commitments, the University’s nine colleges and Graduate School are exploring all fields of knowledge to improve the quality of life.

Clemson began this commitment to people when its doors opened in 1893. That day was the realization of a dream come true for Thomas Green Clemson, a man of wisdom and courage who saw the great need in South Carolina for a scientifically oriented institution of higher learning to provide the state’s young people with the training needed to build a better society.

So strongly was he committed to the establishment of such an institution that he bequeathed his land and other real and personal property to the State for use in creating the “high seminary of learning” he envisioned.

Mr. Clemson was a scientist and agriculturalist who came to South Carolina from Pennsylvania in the 1830s and married a daughter of John C. Calhoun, foremost statesman in South Carolina history and vice president of the United States from 1825-32.

In 1889, the year following Mr. Clemson’s death, the South Carolina General Assembly accepted the terms of his will, and, following the decision of the United States Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas Green Clemson into the reality of Clemson Agricultural College.
The College also was established under the Morrill Land-Grant Act passed by Congress in 1862. Clemson, therefore, is a member of the national system of state universities and land-grant colleges.

In 1964, in recognition of expanded offerings of the institution, not only in the areas of agricultural and mechanical arts, but also in the sciences and arts, the name of the institution was changed to Clemson University.

The University now has nine colleges and the Graduate School. The colleges are Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing and Sciences.

This report presents a comprehensive look at Clemson University, its programs and activities during the 1976-77 academic year.
ACADEMICS

Graduate Studies and University Research
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Undergraduate Studies
Claud B. Green, Dean

University Extension
Samuel M. Willis, Dean

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
Lyle C. Wilcox, 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 Sciences
Henry E. Vogel, Dean
ACADEMICS

Department of Agriculture

Dean

College of Agriculture

Vice Dean

College of Education

Vice Dean

College of Engineering

Dean

College of Fine Arts

Dean

College of Humanities

Dean

College of Law

Dean

College of Medicine

Dean

College of Science

Dean

College of Veterinary Medicine

Dean
COLLEGE OF AGRICULTURAL SCIENCES

Agricultural Instruction

Instruction in agriculture has been an important mission of Clemson University since its formal opening. As stipulated in Thomas Clemson's will, "to afford thorough instruction in agriculture and the natural sciences connected therewith" is the aim of the Agricultural Sciences Instruction Division.

As a land-grant institution, Clemson has an additional mandate to provide instructional programs in agriculture. Clemson is the center of agricultural information in South Carolina and is the only university in the State offering degrees in agriculture at the Bachelor of Science level or higher.

To realize its aim, Agricultural Sciences Instruction is:

- continuously revising and modernizing its educational programs to ensure graduates will be properly prepared to meet future demands of a rapidly changing world.
- developing and offering undergraduate curricula which will provide graduates with an educational foundation and philosophy sufficient for the future.
- offering programs leading to the Master of Science degree and the Doctor of Philosophy degree.
- providing educational opportunities for agricultural employees, assistance in planning and conducting special programs and information about career opportunities in agriculture.

The population of the nation and of the world continues to rise, requiring ever-increasing quantities of food and fiber. In order to meet this demand, a larger number of college agricultural graduates will be needed.

The total agricultural industry is becoming more dynamic and more complex. Agricultural Sciences continuously modernizes its educational program to ensure that graduates will be properly prepared for current and future employer demands. During this fiscal year, as in previous years, changes in curriculum direction and content have been made in response to constantly changing needs and areas of emphasis. All curriculums in the college were revamped as a result of recommendations made by an Ad Hoc Curriculum Study Committee. These changes, which include a new major in Horticulture-Turfgrass, were implemented in order to meet needs for specific skills of graduates.
The college recognizes and accepts the responsibility of disseminating timely information about career opportunities in agriculture. To assist in discharging this responsibility, representatives of this college meet with guidance counselors, science teachers, students and other groups as appropriate. Experience indicates this service is needed and is appreciated. Numerous individuals and groups are provided materials describing career opportunities in agriculture.

The relative importance of agriculture in South Carolina, the nation and world is becoming better understood and appreciated by students entering Clemson. Enrollment in the College of Agricultural Sciences continues to increase rapidly. In 1972, 415 students were majoring in agricultural courses, compared to 1,053 the first semester of 1976-77.

**Agricultural Technology Programs**

Since 1966-67 the college has cooperated with the State Board for Technical and Comprehensive Education and the State Department of Education in conducting programs in agricultural technology at selected technical education colleges in the State. The college's role in this special instructional program 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 at 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 ten two-year programs and three one-year programs in agricultural technology are offered at eight technical education colleges in the State.

Enrollment in the agricultural technology programs has been increasing—from 371 in 1974-75 to 635 in 1976-77. 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 the adoption of new technology and the application of new research results in modern agriculture require that programs of continuing education for professional educators and other agricultural workers remain relevant and utilize the latest research and information.
Interest in in-service training programs continued at a high level. Continuing education activities of this college currently encompass special in-service training programs for Cooperative Extension Service personnel, vocational agriculture teachers and veterinarians in subject areas considered to be of greatest current importance. During the year programs were conducted in 4-H, general agriculture, home economics and communications.

In addition this college conducted many other types of continuing education activities—such as seminars, conferences and workshops—for a wide variety of professional personnel.

**COLLEGE OF ARCHITECTURE**

In a 1976 self-study made in preparation for the regular five-year visit of the National Architectural Accrediting Board, the College of Architecture redefined its role as a professional college. This report focuses on the educational, research and public service areas as defined in the self-study.

**Mission**

The primary mission of the college is the careful selection and formal education of prospective professionals, motivated to growth and service in the development of the built environment.

This concept necessarily embraces studies at several scales in mutually supportive programs in addition to the present curricula offerings and the syllabi for the study sequence; the study contains other anticipated curricula by priorities and the feasibility of implementation measured in terms of resources.

Within the college, the Department of Architectural Studies has the responsibility for the architectural studio design sequences of the curriculum. The Department of Building Science embraces building technology, professional practice and construction management. The Department of Planning Studies includes efforts at the broader scale in regional planning and city planning. Urban Design is of concern to architectural studies and planning studies, and is a collaborative effort. The Department of History and Visual Studies involves architectural and art history and theory and studio courses in drawing, painting, sculpture and ceramic arts, photography and printmaking.

**Research and Public Service**

The second important mission of the college is most carefully related to the educational mission, embracing an expanding program
of sponsored research and public service. At upper and graduate levels, real-world problems are the sponsored vehicles for studies in design, building science and planning.

The College of Architecture’s role in research and public service has been in progress since the mid 1950s. This role emerged initially in a limited way, and has increased in proportion to the growth of college resources and the expansion of graduate enrollment. There has been an unusual public demand for these services both within the State and region, and efforts now include international research opportunities. Representative of research and public service involvement is the contracted studies with the South Carolina Department of Mental Health which commenced modestly in 1968. Now, through successive mutual agreements, these studies involve the college in the physical guidance of new avenues of mental health-care delivery. Resulting from these studies is the general system known as “The Village System.” Currently in the health facilities field alone, assistance is rendered to both general hospitals and specialist units.

More than 15 current sponsored public service and research studies in an academic context are in various stages of development. Some of the studies are departmental in nature, but most are interdisciplinary projects embracing other units within the college, the University and other external resources as may be necessary for their accomplishment.

South Carolina is a developing state and the thrust of the college has been to provide those design and building science professionals needed to guide South Carolina’s physical growth and form. Present service projects of the college range from housing for the rural poor to stimulation of the decaying central cities of the State.

Future Program Plans

In the context of Clemson University as an institution and the College of Architecture as a progressive and evolving part of it, programs are properly based on the needs of the State and the professionals served if the future goal is an optimal built environment. As new needs occur, adequate resources must be vigorously sought and hopefully provided.

Some of the areas of development needed to match the state potential have been the subject of Ad-Hoc Committee recommendations during the year. These include:

- The development of a Master of Landscape Architecture curriculum which would be of vital help to the best physical develop-
ment of the State. This would occur in a variety of ways, partly as a complement to present and potential work in state and regional planning studies.

At the smaller scale, landscape studies would complement both architectural design teaching and public service. Landscape architects on the faculty are seriously pressed for their valuable time, serving as members of studio teams and on juries. Although design studios make a serious effort to show the importance of the best land use and of the organic relationship of building design to site, the occurrence of a landscape program would greatly enhance this understanding.

Nature has provided South Carolina with fragile ecological treasures, and it is particularly blessed with diversity of terrain, soil types and plant materials. These endowments are becoming more precious in an expanding society with increasing developmental demands. Leadership in landscape design is badly needed.

- As part of this self-survey, the Department of Building Science has not only delineated its present strengths and weaknesses in succinct terms, but has developed the need for graduate study in building science and management. Such a program would give professionals the expertise to expand the spectrum of professional services to fill a serious void in building science management. Leaders of the state's building industry are supportive of this offering development, considered most necessary to the State and region.

- The State has some important and innovative leaders in product production. A product design curriculum in the college would be established on industry need and on the strong core studies already taught in the college. Furniture manufacturing, now in its infancy in South Carolina, has great promise. The industry is of considerable importance in North Carolina, and both states are rich in lumber producing forests. The South Carolina textile industry is the largest in the nation in terms of product-volume and should increasingly have need for the design of textile-related products. These industries would be enhanced by the development of an excellent product design curriculum, and key people are mindful of product design needs in education, research and public service.

Quality Control

Efforts have been made in all feasible ways despite constrained budgets to assist and encourage faculty motivation and growth. Participation in the most challenging work is assigned by rotation,
and the development of special continuing education short courses is encouraged. Wherever possible, externally provided resources are utilized to enable faculty members to attend scholarly meetings and training courses. Faculty are asked to develop relevant individual research and personal creativity to the extent of available time. Motivation varies both in type and intensity, and the checks and balances that occur in the administrative process attempt to assure the proper reward of creativity and motivation.

**COLLEGE OF EDUCATION**

The College of Education continues to emphasize teaching and instruction, public service and research.

*Teaching and Instruction*

The college revised its systems approach to curriculum development to give practitioners and other professionals greater opportunities for contributing to curricular decisions.

The State Board of Education revised upward the National Teacher Examination scores which are required for certification in South Carolina. The College of Education ranked first in the percentage of students qualifying from state supported colleges and universities.

*In-Service Programs and Services*

The college provided both credit and non-credit in-service and staff development programs to teachers and other professional educators. The college conducted 117 off-campus courses for university credit at 45 different locations in the State and enrolled more than 2,500 teachers who were upgrading their professional skills. Cooperating colleges—Columbia, Erskine, Newberry, Presbyterian and Wofford—offered 18 courses to 55 teachers who were awarded Clemson University graduate credit under a cooperative institutional agreement.

The college received more than $150,000 to provide developmental training programs in various areas. The Department of Agricultural Education conducted a summer institute course for agriculture mechanics teachers of the educationally disadvantaged and handicapped. For teachers and administrators, the Department of Industrial Education held workshops and courses in curriculum development, equipment maintenance and prevocational education. The Printing Industries of The Carolinas (PICA) awarded a grant to continue the curriculum projects in graphic communications.
The College of Education sponsored a variety of conferences and workshops on campus. The agricultural teachers V-TEC conferences were attended by more than 100 teachers. The Clemson Reading Conference attracted more than 1,400 participants, while the regional conference on testing was attended by more than 250 educators. Special education workshops enrolled more than 75 persons and a seminar on Competency Based Instruction was held for 25 selected teachers. The Future Farmers of America convention brought more than 250 participants to the campus.

Research

The Vocational Education Media Center was involved in a variety of activities. The Center Staff completed the V-TEC's catalog for "Small Gasoline Engine Repairman and Textile Loom Operator," and was nearing completion of "Business Machine Repairman." New development has been initiated for "Homemaker and Agricultural Production."

Two grants were received during the year. Sponsored by the Appalachian Regional Council of Governments, a project for Prevocational Education involved the development of introductory instructional materials covering approximately 65 areas for which vocational education is offered in South Carolina. The materials include kits of tools and equipment which can be loaned by schools to provide "hands on" experience. Approximately 90 kits of tools and equipment have been designed. The materials will be tested this coming school year. A grant from the U. S. Office of Education involved selecting existing instructional materials and developing materials which are not available for the implementation of four curriculums based on V-TEC's catalogs in carpentry, auto mechanics, banktelling and bookkeeping. The materials will be evaluated during the 1977-78 school year.

Special Activities and Services

The Department of Aerospace Studies and Military Science sponsored the Fifth Annual Tiger Drill Meet which provided competition for junior ROTC drill teams from high schools throughout the State. The winner was awarded the Governor's Trophy.

Faculty members were appointed to serve on special task forces to study vocational education in the State, graduate teacher education and certification.

The Department of Agricultural Education worked with more than 1,400 vocational agricultural students in a state-wide standard-
ized achievement program designed to measure knowledge of stu-
dents in off-farm occupation courses.

The Department of Industrial Education conducted a leadership
workshop for 56 trades and industry teachers, offering instruction
on the techniques of organizing local youth clubs in high schools.
The workshop resulted in the organization of a state Vocational-
Industrial Club of America (VICA) which has more than 1,600
student members.

COLLEGE OF ENGINEERING

Goals of the College of Engineering are:

• To supply the trained manpower vital to technological progress
  in South Carolina and the nation.

• To conduct research that expands upon engineering knowledge
  and education.

• To serve the public by taking engineering education and ex-
  pertise beyond the campus directly to citizens in government
  and industry, and to the practicing professional.

The academic year 1976-77 was one of the most productive in the
history of engineering at Clemson in meeting these goals. Of course,
no school of engineering can function without excellent facilities
and an excellent faculty.

In addition to the time spent in the classroom, the 100 men and
women of the College of Engineering faculty also: design and re-
vise courses on a regular basis; conduct research; advise under-
graduate and graduate students; serve as consultants to state and
federal agencies and industry; publish technical papers and text-
books; serve on university councils and committees; teach an aver-
age of four Continuing Engineering Education courses and work-
shops each; and share their expertise with the general public
through speaking engagements and related professional public
relations.

Two women were added to the faculty during the year, and the
first McQueen Quattlebaum Faculty Achievement Award was
given to Dr. John Gowdy, associate professor of electrical and com-
puter engineering, for outstanding accomplishments in teaching
and research on computer recognition of speech and the application
of computers to quality control in the textile industry.

The National Science Foundation awarded a $63,000 grant to the
Department of Electrical and Computer Engineering in 1977 to
purchase additional equipment for its half-million dollar hybrid Engineering Computer Laboratory. The new equipment will allow expanded research of EEG analysis, rail vehicle dynamics, computerized speech recognition and non-destructive ultrasonic testing of materials. The renovation and expansion of McAdams Hall, housing the Department of Agricultural Engineering, was completed at a cost of about $2.3 million. Data processing for the labs in McAdams will be handled by a new Altair 8800 A computer.

College of Engineering laboratories and special equipment, now valued at more than $30 million, are housed in eight buildings and include facilities for real-time computing, ceramic pilot testing, instrument calibration, experimental surgery and instructional systems development.

**Education**

Six basic and four advanced level engineering programs were re-accredited by the Engineers’ Council for Professional Development for another six years.

The College now offers six traditional undergraduate degree programs, as well as engineering analysis and engineering technology programs also leading to the B.S. degree. A dual degree program allows students to earn bachelor degrees from Wofford, Lander, Newberry or Presbyterian colleges, followed by a B.S degree from Clemson, in a five-year program which encourages a strong, basic foundation for an engineering career. A total of 54 undergraduates in seven degree programs also participated last year in the University's Cooperative Education Program which allows students to alternate after their freshman years between academics and full-time work in industry. Engineering undergraduates make up 84 per cent of all students participating in the program.

Undergraduate enrollment at the close of the year is expected to reach 1,800, the highest level since 1958. More than 610 new freshmen and transfer students are expected to enroll in the fall, a 15 per cent increase over last year. The demand for B.S. engineers also continues to grow. Starting salaries for May 1977 engineering graduates averaged more than $15,000, up by $2,000 from last year, and graduates averaged more than three job offers each. Demand was great for women graduates, who often started at higher salaries than the men.

At the graduate level, 143 students are enrolled in the Master of Science degree program and 38 are in the doctoral degree program. Clemson offers the M.S. degree in 12 fields, the professional M.E.
degree in eight, and the Ph.D. degree in nine. An external Master of Engineering degree is also offered, off-campus with no residency requirement, to engineers who work full time but desire professional updating in mechanical, electrical or systems engineering.

Sixty-five students participated in college Honors and Awards Day activities in April, accepting seven major awards, 35 scholarships and 33 departmental awards. Thirty-seven students were accepted into the Engineering Honor Society, and for the first time last year a woman achieved the highest scholastic standing among graduating engineers by earning a 3.97 average in electrical and computer engineering.

To help assure the continued high caliber of engineering students at Clemson, Engineering Open House was held in April, bringing to campus more than 2,400 high school students from 61 schools in North and South Carolina and Georgia. High school guidance counselor workshops were held in Columbia, Spartanburg and Charleston, and in March the local student chapter of the Society of Women Engineers sponsored a two-day tour of the campus and engineering facilities for 20 outstanding high school seniors.

Research

College of Engineering research expenditures during 1976-77 exceeded $1.2 million on more than 65 projects sponsored by federal, state and industrial grants. Total research grants-in-force, including multi-year contracts, top the $4 million mark in projects ranging from development of prosthetic bone devices to a computerized control system for nuclear fuel reprocessing plants.

Long before the nation became concerned about crippling energy shortages, Clemson engineers were active in energy-related research. In 1971, College of Engineering projects were being conducted to reduce industrial costs and reuse previously lost hot water and to investigate development of new fuel resources from the gaseous hydrocarbons of plants. Today, more than $1 million is committed to energy-related projects alone, with another $600,000 proposed. Some of the energy research projects under way are:

- A $175,000 study to develop information processing techniques to detect and prevent loss of radioactive material in nuclear fuels reprocessing plants, sponsored by the Energy Research and Development Administration (ERDA).

- An Environmental Protection Agency (EPA) study of energy conservation and pollution control through recycling using high temperature hyperfiltration.
• Two ERDA-sponsored studies valued in excess of $200,000 on solar energy storage and optimum energy use in the textile industry.

• An ERDA supported graduate training program in environmental systems engineering, one of only four in the nation.

In the area of health care, many exciting studies are underway by engineering researchers, including analysis of electrocardiograms (ECG) and electroencephalograms (EEG) by microprocessors; a study of elasticity and stress analysis in human lungs; and development of prosthetic body parts from ceramic and plastic materials. The patent for a plastic bone-end cap for juvenile amputees was recently awarded in bioengineering.

In the area of pollution and environmental control, training programs and the development of instructional materials for training wastewater treatment plant operators has been funded by EPA. Other research is defining economically feasible wastewater treatment techniques for dye manufacturers, and investigating overland flow as a method of domestic wastewater treatment.

Other areas of sponsored engineering research include housing and solar heating of the home, highway construction and agricultural and fisheries mechanization. The college’s Industrial Associates Program, designed to encourage cooperative efforts with industry, supported projects to study damage to sewer pipes, computer quality control testing and power supply design.

Public Service

College of Engineering public service activities, largely through Continuing Engineering Education (CEE), grew dramatically again for the fifth straight year. During 1976-77 more than 11,000 people attended 457 CEE courses, seminars, workshops and symposia, making the Clemson program one of the strongest, fastest-growing continuing engineering education programs in the Southeast. Participants came from every area of South Carolina and from more than 40 states and 45 foreign countries. Examples of programs include courses in using the computer as a management resource, metrisation for secondary school teachers, building and highway construction, industrial electrical power systems, pollution control and technical and business writing. And, again addressing the current emphasis on energy, courses in energy conservation, solar energy potential, energy alternatives for brick manufacturers, and combustion and fuel utilization also were presented. The popular summer workshops in computer science for high school students again attracted more than 125 young participants.
State government and industries, in particular, benefit by the expertise of engineering faculty members who serve as advisers to agencies such as the State Development Board, State Technical Education System, Board of Health and Environmental Control, Highway Commission, Nuclear Advisory Council, Energy Research Institute, and the Governor's Energy Management Office.

The College of Engineering was joined in April by the College of Industrial Management and Textile Science and the College of Agricultural Sciences in hosting the first Charles Carter Newman Symposium on Natural Resources Engineering, co-sponsored by the National Bureau of Economic Research. Some of the world's leading experts in engineering, agriculture and economics gathered to discuss the positive aspects of "Alternative for Growth: The Engineering and Economics of Natural Resources Development" as a distinct alternative to the widely publicized "limits to growth" concept of a few years ago. Establishment of both the symposium and an endowed chair in natural resources engineering was made possible by a half-million dollar gift from Clemson alumnus J. Wilson Newman in honor of his father, a teacher and researcher in horticulture at Clemson for almost 50 years.

COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources continues to make steady progress in meeting its stated purpose of, "the gathering and dissemination of knowledge pertaining to all fields of forestry and recreation through:

Undergraduate and Graduate education
Imaginative and creative research programs
Service to and cooperation with the public."

This charge was carried out in various ways by the two departments, Forestry and Recreation and Park Administration.

Teaching

Undergraduate enrollment in both departments, after a long period of steady growth (62.5 per cent increase since 1970), has leveled off at approximately the numbers projected as optimum in the 1970 self-study. The primary area for increased undergraduate enrollment is the wood utilization curriculum.

Graduate student enrollment in the master's programs continues to grow at a healthy rate, and should continue to increase. The new Forest and Recreation Resources building has provided flexibility
to accommodate more graduate students. The master’s programs have matured to the point that doctoral programs will need to be added in the near future. Graduate student research projects continue to prove valuable not only as training tools for students but in providing information of value to the forest and recreation fields.

The stabilization of undergraduate student enrollments allows the faculty to concentrate on improving the instructional program. Both departments engaged in careful and thorough analysis of current curricula during the year. Changes needed for optimum curriculum development will be recommended, reflecting a commitment to the best education possible for students.

**Research**

Forestry research, which emphasizes the production of wood for use as a raw material and as a material of construction, encompasses many studies which may seem novel to those not accustomed to the broad range of problems faced by the forest landowner or the practicing forester.

Several grants funded research on increasing the resin accumulation in the tree. We have been able to more than double the tree’s resin content which doubles its value. The increased resin content also doubles the calorific value of the wood and greatly increases its attractiveness as an alternative energy source.

Dune and beach migrations were traced over a period of 242 years in a publication released during the year, illustrating the large amount of change that can occur in this dynamic system.

Feral hogs have ranged southern forests since the days of the first European settlers. This “piney woods rooter” probably has a greater impact on the coastal plains forest than any other animal, yet very little is known about the beast and the magnitude of his effects. Recent publications by forest researchers show that the feral hog occupied 42,330 square miles across the Southeast. Research also found that Brucellosis, a swine disease for which there has been an active eradication program in domestic herds, occurs in the feral hog population. Because of the leadership in this field, a symposium on the “Research and Management of Wild Hog Populations” was held at the Belle W. Baruch Forest Science Institute at Georgetown. Wild hog management is a problem in many areas of the world, judging from the large number of requests from foreign countries for publications on the feral hog.

Endangered plants and animals are other areas of research. Federal grants support study of the Red-cockaded Woodpecker and its
habitat requirements in order to more efficiently conduct forest management operations, yet protect this forest bird. A report on the distribution and abundance of *Shortia galacifolia* is the first of many such reports expected from research on rare and endangered forest plants in South Carolina. This research is aimed at determining the extent range and habitat of each endangered forest plant and developing management techniques to efficiently manage and protect such species.

Research in the Department of Recreation and Park Administration is still modest in scope. Its potential for expansion has been enhanced by the presence of the U. S. Forest Service’s Forest Recreation Research Unit. Already this unit has been responsible for two cooperative studies: “The State of Knowledge of Relationships between Public and Private Suppliers of Forest Recreation,” and “Relationships between the Public and Private Sectors in Supplying Forest Recreation.” An update of the Chattooga River Study has been undertaken since visitor use declined significantly during the initial year of implementation of the new management plan.

Several studies by graduate students were supported in part by the department. These included: “An Interpretative Prospectus/Park Plan for Redcliffe Plantation”; an “Interpretative Prospectus—Clemson Experimental Forest”; “State Park Law Enforcement—A Management Strategy”; and “An Interpretative Prospectus for Hobcaw Barony.”

**Extension**

A principal forestry extension activity during the year is in the area of data compilation and publication. Valid data forms have been developed in cooperation with state and federal agencies, forest industries and private firms. The new forms of data are now being accepted and published in publications such as the “cash receipts” bulletins of the South Carolina Crop and Livestock Reporting Service. Another “first” was the release of a county forestry fact sheet for each county. Plans are to continue to update the data base and publish current county forestry fact sheets periodically. Techniques for achieving this objective are in the planning stage.

Another principal activity in forestry extension is a cooperative effort with the Department of Agricultural Economics and Rural Sociology to develop an acceptable procedure for assessing agricultural real property for tax purposes. When fully developed, this procedure will enable the South Carolina Tax Commission to im-
plement the agricultural fair market value provisions of the new tax law.

Training sessions were held at various locations throughout South Carolina for forest landowners, practitioners and the general public. Some examples include a pesticide certification workshop for practitioners held in Columbia, a marketing program for landowners in Lancaster, a prescribed burning meeting for landowners and practitioners in Manning, a log and lumber grading workshop at Clemson and a reforestation meeting for landowners in Lexington. Numerous media items also were produced and released for landowners.

The extension efforts of the Department of Recreation and Park Administration were greatly expanded. Continuing education programs included workshops for commissioners and board members, an executive workshop, a seminar on women in recreation and two therapeutic workshops.

More than 25 groups were served in the Outdoor Laboratory in addition to the on-going, expanded camping programs for the retarded, the emotionally disturbed, the elderly and the underprivileged. The College Week program continued to be popular with maximum registration for the fourth straight year.

Park plans were prepared. Major projects included Bennettsville Recreation Area, Iva Town Park, Laurens County Park and Calhoun Park of Barnwell.

An in-depth study of the Irmo-Chapin Recreation Department was done at the request of the District’s Recreation Commission. A similar study was begun in Union County but has not been completed.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

Completion of architectural plans for major renovation of its facilities and accreditation of four undergraduate business curriculums were among the significant events which highlighted the year.

The initial phase of the 2 million dollar plus project—the first major renovation since Sirrine Hall was built in 1938—was expected to get under way in the fall of 1977.

Already in progress as the academic year ended was the relocation of the U. S. Department of Agriculture’s laboratories from Sirrine Hall to Ravenel Research Center across Lake Hartwell from the main campus. In addition to the 22,000 square feet vacated by
USDA, Sirrine Hall's 16,000-square-foot attic will be converted to usable space.

The two projects will give the growing college some 38,000 square feet of space for classrooms, faculty offices and accounting and finance laboratories. The increasing demand for courses in business and management and the establishment of a Department of Accounting and Finance in 1975 have resulted in rapid growth for the college.

It is the largest at the University in terms of undergraduate majors—1,640 for fall 1976 compared with 1,523 the previous year.

In April 1977 the college's undergraduate business programs were accredited by the American Assembly of Collegiate Schools of Business. Programs were accredited in accounting, financial management, administrative management and industrial management.

Following is a look at the four departments within the college and the Office of Professional Development.

Department of Textiles
The number of students majoring in textiles as well as others taking textile courses showed significant increases over the previous year. Undergraduate textile majors increased 12 per cent and others enrolled in textile courses was up 66 per cent.

The textile technology curriculum, in existence for four years, has an enrollment of 76, including 15 women. The Bachelor of Textile Technology program includes courses such as economics, management, sociology and psychology which are helpful in preparing students to begin careers in the textile industry.

The leadership of the Department of Textiles changed, with Dr. Edward A. Vaughn becoming department head on July 1, 1977. He succeeds Dr. E. I. Stearns who retired after serving in the post for five years.

Department of Industrial Management
During the year this department was involved in a diversity of activities designed to improve the quality of faculty, the quality of programs administered by the department and services provided to the industrial community. Selected faculty were involved in a self-study of the curriculums of the college which were being considered for accreditation by the American Assembly of Collegiate Schools of Business. This endeavor resulted in both management programs being accredited.
The Clemson-Furman MBA program reached a record enrollment of 172 students. Research efforts continued to expand, with 20 papers presented to local and national professional associations.

**Department of Economics**

The recent heightened interest in economics continued its upward trend, with enrollment in undergraduate courses exceeding the previous year's all-time high and approaching the level of 1,900 students per semester. Fifteen students were enrolled in the master's program and five completed their theses and degrees during the year.

Learning laboratory equipment provided by the J. E. Sirrine Foundation continues to be used extensively. A graduate student assigned to the lab coordinates its use among several hundred students taking courses in principles of economics. The program was successful in providing the back-up learning resources for students having difficulty with first courses in economics and those simply wanting to broaden their exposure to economic concepts.

Several research projects were completed, continued or begun. A two-year study was completed in which expenditures for judicial services at the state and local levels across the nation were analyzed. The work was supported by the National Institute for Law Enforcement and Criminal Justice.

Also completed was a regional housing market analysis for the S. C. Appalachian Council of Governments, and a project funded by the S. C. State Department of Education to develop a kit of concepts, activities and resources for teaching economics in the public schools. Another project—an analysis of the labor effects of right-to-work-laws—got under way, supported by the National League Defense Foundation.

**Department of Accounting and Finance**

During the year the Bachelor of Science degree programs in accounting and financial management were accredited by the American Assembly of Collegiate Schools of Business. It followed rigorous evaluations of the programs by a college self-study committee and a visitation team appointed by the assembly.

Excellence in undergraduate teaching continued to be high in the priorities of the department and research and publication efforts of the faculty increased. Presentation of papers at regional and national professional meetings increased substantially.
The upward trend in student demand for courses in accounting remained strong, in 1976-1977, 555 students majored in accounting and financial management and a total of 1,900 students were enrolled in accounting and finance courses each semester.

Thirty students graduated with a major in accounting and 51 graduated with a major in financial management. Employment opportunities for these graduates continue to be excellent.

Students entering programs of this department present excellent scholastic credentials for admission. The average entering student graduated in the top 15 per cent of his or her high school class.

**Office of Professional Development**

Attendance for professional development courses increased 23 per cent over the previous year. At the same time, the number of courses offered increased 17 per cent. The majority of participants came from South Carolina, with North Carolina, Georgia, New York and Virginia completing the top five in terms of attendance support.

More than half the attendance was in courses devoted to management topics, while close to one-third of the enrollment was in textile-related programs. Seventy-seven management-type courses were presented while 33 textile-related courses were held.

More than 1,000 different companies were represented by participants. Unique programs included a special management development program on campus for Multimedia, a national newspaper-television corporation; a textile science program on new technology in knitting held at the Union League Club in New York City; and the second annual Economic Outlook Conference jointly sponsored with the Greater Greenville Chamber of Commerce which attracted 700 participants.

**COLLEGE OF LIBERAL ARTS**

It has been said that no university can ever become a great university without a strong program in the humanities and the social sciences. The College of Liberal Arts recognizes that dictum. It is founded upon the idea that a self-governing society requires of its citizens a basic general education which will enable them, regardless of their occupational or professional interests, to lead fuller lives, more useful lives and to contribute to the general welfare.

But even with those lofty ideals, the College of Liberal Arts, like all colleges at Clemson, is steeped in a tradition of practical endeavor.
In 1976 the college sponsored a two-week summer course for South Carolina school teachers on Energy Alternatives, surely one of the most pressing problems the youth of today must face as the adult decision makers of tomorrow.

The Department of Languages also has a very practical, business orientation as it encourages Clemson students to major in fields such as engineering and textile science and minor in a modern foreign language. That is a forward-looking career option when you stop to remember that South Carolina is fourth in the nation in the amount of foreign investment in the State.

Through the Robert A. Taft Seminar in Government and Practical Politics, the Department of Political Science provides the state's teachers with practical knowledge of how government works and arms them with information to involve young people in government decision making. It is a measure of the quality of the College of Liberal Arts that this program has been called the finest in the United States by the Taft Institute's director.

One important contribution of the college to the University is sponsorship of a large number of student and university organizations and extracurricular activities, many of them open to the public without charge.

The Department of English sponsors the Clemson Players, the Debating Team, and assists with management of the Tiger, the Chronicle and the Calhoun Literary Review. It presents annually a well-known and widely attended Children's Literature Symposium. It operates a writing laboratory to provide tutorial service to students with writing deficiencies. And it offers workshops throughout the State for public school teachers and for industrialists and businessmen interested in business and technical writing.

The Department of Music sponsors and manages the Concert Band, the Marching Band, the University Chorus, the Liberal Arts Chamber Music Series and the University Concert Series.

The Department of Languages sponsors annually a foreign language and drama festival with several dozen casts from four states competing in four languages, and a language declamation contest which draws more than 100 participants from several states.

The Department of Political Science sponsors the University's Model United Nations Representation Team, which received a citation in 1977 for excellence.
The Department of Psychology sponsors a popular club for its major students and provides consulting services to mental health centers of the State.

The Department of History continued its popular weekly book review column service for newspapers.

Organization and Influence

The College of Liberal Arts is made up of the Departments of English, Languages, Music, History, Political Science, Psychology, and Sociology. All departments except Music offer the Bachelor of Arts degree; English and History offer the master's degree as well.

Though only about 15 per cent of Clemson undergraduates major in the various disciplines of the liberal arts, the influence of the college is extensive because approximately one-third of the teaching of the entire University is done under its auspices. Sixty-five per cent of the faculty hold the doctorate; graduates of the college readily enter the outstanding graduate and professional schools of the country.

Professional Activity and Scholarship

Two members of the history faculty, collaborating with the local educational radio station, secured a $10,000 federal grant to develop programs on "History in Opera," which promises to bring wide attention to the department.

A member of the English faculty, Ben Skardon, was named Clemson's Alumni Master Teacher.

The "South Carolina Review," a journal publishing distinguished literary scholarship and original fiction and poetry, continues to receive favorable notice in scholarly circles and to extend its body of readers and contributors. A federal grant made it possible to publish a particularly distinguished issue devoted to "Carolina Writers."

The "Journal of Political Science" continues to be sponsored by the Department of Political Science and edited by members of the political science faculty.

Both the Department of Political Science and the Department of Sociology extended their public service activities during 1976-77 by furnishing consultation to political units and social service agencies throughout the State.
COLLEGE OF NURSING

The number of students enrolled at the undergraduate level remained about the same with 400 in the baccalaureate degree program and 100 in the associate degree program. The graduate program had an enrollment of 15 students during the fall semester. Two students were awarded the Master of Science in Nursing degree. One of the graduates will be employed at the College of Nursing as instructor in community health and the other holds a faculty appointment at USC—Spartanburg branch.

Policies for admission and promotion to junior year courses for the baccalaureate program in nursing were revised to become effective with incoming classes. A high correlation was found between low SAT scores and poor performance in the science courses for those graduates who had difficulty passing the state licensing examination.

Faculty recruitment has been very good in that applications are being received from more experienced faculty. The reputation of the faculty through publications and committee work has prompted a number of people to apply. The college needs the positions that were not approved if any and all of the programs are to attain a greater degree of excellence. Advertisements announcing the new position of assistant to the dean of research development have been distributed to relevant journals to meet affirmative action stipulations.

The baccalaureate program was visited by Mrs. Virginia George, associate professor, Vanderbilt University, representing Sigma Theta Tau, the national honor society in nursing. Upon completion of this accreditation visit, Mrs. George indicated that she would heartily endorse the college to the National Council of Sigma Theta Tau during the annual meeting in October. If the college is accepted, the chapter would be installed in the spring. This is a prestigious recognition of the excellence of faculty, students and program.

A faculty Search Committee has been appointed to seek a director of the baccalaureate program. With only one-tenth of one percent of the nurse population prepared at the doctoral levels and about 40 deanships vacant, we do not expect to fill the position in the very near future. In the interim, the dean has assumed responsibility for this department; faculty who have been designated course coordinators have been given additional administrative responsibilities.
Continuing Education

Miss Judy Chodil, candidate for the Ph.D. at New York University, has accepted the position as director of continuing education, effective August 1, 1977. Miss Chodil has experience in continuing education as a result of her association as assistant and intern director of New York University Department of Nursing Continuing Education Program.

The Pediatric Nurse Practitioner Program, a cooperative program with Medical University and Greenville Hospital System, supported by AHEC funds, will be discontinued as of August 1, 1977. The program attracted few students; 14 were awarded certificates and pediatricians did not seem to support having a nurse in this physician extender role. The assessment skills taught in the program are incorporated in the college's master's program. The Medical Education Department at Greenville Hospital System supports our efforts in this direction.

The Emergency Medical Service contract has been renewed. The two clinical specialists are providing in-hospital instruction in care of patients who have emergency and critical care needs. The programs are offered in all hospitals in the seven-county area included in the Appalachian Health Service area. More than 300 nurses have received instruction to this date. A high turnover in staff nurses compounds problems of instruction since classes have to be repeated frequently.

COLLEGE OF SCIENCES

The long-term growth of teaching, research and public service programs in the College of Sciences was underscored this year with the official opening of Jordan Hall, named for Clemson alumnus F. Marshall Jordan. This $90,000 square-foot facility houses more than 50 research and teaching laboratories to be used by the Departments of Biochemistry, Botany, Microbiology and Zoology to conduct biological research, as well as to teach more than 5,000 students each semester. In addition, the building contains several sophisticated support areas such as the electron microscope facility on the ground floor and a greenhouse and small animal facility on the roof. The Department of Zoology will maintain a small museum which already contains the fifth largest bird egg collection in a university. The Department of Botany has an extensive herbarium, a library of all plant species from South Carolina and many other parts of the world.
The college continues to carry one-third of the teaching load of the University as a result of programs for its own majors coupled with its service function to the other eight colleges. The number of majors has remained essentially constant, a result of a leveling in enrollment for the University as a whole. Continued concern over environmental and energy problems, as well as interest in health affairs has maintained a constant pressure towards strong interest in study in the sciences.

**Department of Biochemistry**

The B. S. degree program initiated in 1975 showed rapid growth, with 42 students enrolled in 1976-77. The cumulative grade-point-ratio of these students at the end of the academic year was 3.3. In addition to the undergraduate majors, 22 were students enrolled in the graduate program. About 800 students were enrolled in biochemistry courses. Three M.S. degrees and five B.S. degrees were awarded. One of the B.S. degree graduates—with a straight A average—was presented the Clemson University Faculty Scholarship Award and also won the American Association of University Women and Phi Eta Sigma awards.

Eight outside research grants were held by the faculty; three from The National Institute of Health, and one each from The National Science Foundation, Water Resources Research Institute, Muscular Dystrophy Association of America, South Carolina Heart Association, and NATO. The sponsored research included projects dealing with a serum enzyme and its relation to muscular dystrophy, the maturation of red blood cells, and herbicide degradation.

Fifteen papers were given at national meetings, 13 at regional meetings, 14 outside seminars were presented, and 11 manuscripts were published.

Fourteen seminar speakers visited the department. Dr. W. O. Boggan of the Medical University of South Carolina presented a minicourse on the “biochemical basis of neuropharmacology.”

**Department of Botany**

The new 15,000 square feet of space made available to the department by Jordan Hall, coupled with additional personnel to carry out normally expected, but previously impossible functions, will enhance the quality and quantity of contributions by existing faculty.

General botany, as a basic freshman course, has been taught for the last time. This course, along with the sister course in zoology,
has been replaced by two freshman biology courses designed to meet the requirements in basic biological subject areas of students in all curricula. Additionally, the department has installed several new courses in various aspects of basic plant science at both the undergraduate and graduate levels.

Research in the department continues on such projects as aquatic fungi for the control of mosquitoes, heavy metal concentrations and effects in fresh water lakes, the chemistry and ultrastructure of the process of food manufacture in green plants, and study of the relationships, occurrence, genetics, and conservation of flowering plants in the State and the southeastern United States. Several papers have been presented at scientific meetings by faculty members and graduate students.

As a service to the agricultural industry and the general public in South Carolina, several hundreds of flowering plant specimens have been identified by our herbarium curator. On infrequent occasions a faculty member is called on to identify wild mushrooms which may have been consumed by patients of physicians locally and as far away as Charleston.

Department of Chemistry and Geology

Dr. R. A. Abramovitch, research professor at the University of Alabama, was appointed head of the department, effective August 1, 1977. Dr. Abramovitch's distinguished career as an organic chemist includes major contributions in education and research.

Enrollments in chemistry and geology courses, especially the advanced courses, continued to increase as more students are attracted to scientific, professional and technological careers.

Research productivity was at its highest level in several years. Two new research projects were funded: (1) Development of a new method of storing radioactive wastes, by the U. S. Energy Research and Development Administration, and (2) A study of the tectonic history of the central Blue Ridge, by the National Science Foundation.

The faculty published 25 papers in major journals and two textbooks. Twenty-five seminars were presented at other institutions and agencies, and 30 papers were read at regional, national and international meetings and conferences.

The Student Affiliate Chapter of the American Chemical Society received national recognition for the fifth consecutive year, a notable accomplishment.
The M.S. degree is the preferred degree for practicing geologists. To meet this need, a proposal to establish this degree program was submitted.

**Department of Mathematical Sciences**

The department continued to offer a comprehensive approach to statistics, computer science, operations research, and core mathematics. This unique integration of the disciplines in a single administrative department has gained national recognition through Clemson’s receiving one of the National Science Foundation “Alternative in Higher Education in the Mathematical Sciences” grants. This program sponsored four faculty visitors for the year. Three additional faculty members spent a sabbatical year with the department observing its integrated programs. Many features of the Clemson program will be implemented at the seven universities represented in the programs. Next year the department plans to host 10 visitors, and interest indicates there will be a significant number of brief visits by faculty members from other institutions. Clemson’s integrated approach to mathematical science is receiving both academic and industrial interest. Several companies now aggressively recruit the graduates of this versatile and forward-looking program.

The faculty continued to receive national recognition by appointments to positions in major organizations. Three members served as visiting lecturers for the Mathematical Association of America, the Society for Industrial and Applied Mathematics, and the Mathematical Association of America’s Committee on Undergraduate Programs in Mathematics. The Society for Industrial and Applied Mathematics Visiting Lecturer Program for the southeastern region was coordinated by a department professor, while another served as chief reader for the Educational Testing Services in the College Board’s Advanced Placement Program in Mathematics.

**Department of Microbiology**

In 1976-77 another dimension was added to the microbiology teaching program by a new course dealing with the microbiology of coastal and ocean waters. It deals with both basic and applied aspects of marine microbiology, such as the microbial degradation of oil spills. This course will be invaluable to students planning to work in the environmental field, particularly those who will be involved in coastal and marine planning.

The number of microbiology majors has remained similar to that of the previous year, approximately 20 per cent of all majors in the
College of Sciences. A total of 65 students received the B.S. in microbiology and 10 received the M.S. degree.

Among department research projects, one was noteworthy because of the fact that South Carolina ranks in the top five states for prevalence of the communicable disease gonorrhea. Past studies carried out in the department had shown that the disease occurring in the Piedmont region of South Carolina was becoming more and more resistant to treatment with penicillin, the antibiotic currently used. Recent studies with a group of chemotherapeutic agents, known as sulfadriugs, suggest that some of these may be useful in treating the disease if penicillin can no longer be used.

In the United States approximately 1,500 pounds of organic solid waste material is produced per person per year, and about 50 per cent of this is cellulose. Another research project was concerned with developing a more efficient disposal of this waste by attempting to convert it into an energy or nutrient source. It has been found that one of the cellulases (biological enzymes) is prevented from degrading cellulose in the presence of certain herbicides, which could present a problem with composting of some agricultural organic wastes.

A project initiated during the year dealt with a base line ecological study of marine microbes in the waters off the coast of South Carolina. The findings will be useful in the detection of future pollution of these waters, and they will be valuable in formulating any environmental impact statement required for oil and gas lease sales off the Carolina coast.

Salt marshes play an important role in providing nutrients for animal life in adjacent coastal waters. An important step in the food chain is the microbial conversion of marsh plants to materials that are more nutritious and more available to marine animals. The major thrust of one research program is to understand this complex process brought about by microorganisms. Another aspect being investigated is the contribution of photosynthetic bacteria to primary productivity and nitrogen fixation in the marsh. Such studies will aid in understanding the overall ecology of salt marshes and in planning their protection and exploitation.

Department of Physics and Astronomy

Enrollment in physics and astronomy courses continued at a high level. In the fall of 1976 an improved format for the physics courses designed for science and engineering students was introduced. The
format includes two lectures per week in addition to a two-hour period devoted to a discussion of problems and practical applications. The new arrangement has proved popular with students and faculty members, and has resulted in a significant increase in the quality of physics instruction available to undergraduates majoring in the natural sciences and engineering.

During the year the department had the opportunity of appointing an Alumni Visiting Professor. The position was accepted by Dr. Frank S. Ham of the General Electric Company's Research Laboratory. Dr. Ham is a highly distinguished solid-state physicist. During the course of his year at Clemson he conducted a seminar on the physics of point imperfections in crystals. Students and faculty members of the department benefited significantly from the seminar, and from the opportunity of consulting and collaborating with Dr. Ham on a personal basis.

The department's activities in the area of research and graduate study continued to be productive. The largest single area of specialization was in solid-state physics, which involved about two-thirds of the department's 26 faculty members. These activities were directed toward the study of electrical, mechanical and thermal properties of crystalline materials, and the department is recognized as being one of the largest and best solid-state research groups in the Southeast. This area of research has many practical applications related to communications, technology, energy production and conversion, and metallurgy. Other ongoing research programs included biophysics, wherein fundamental studies related to the self-repair mechanisms of DNA molecules were being made; atmospheric physics, in which studies of hail formation and distribution continued; quantum theory; astrophysics; and relativity theory.

The department's planetarium continued to be a popular educational and public-service facility. During the year its presentations were attended by more than 5,000 adults and school children. Apart from its value as an instructional aid in Clemson astronomy courses, it serves as a unique and interesting way of introducing elementary and secondary school students to the fascinating study of the structure of the solar system, galaxy and universe.

Department of Zoology

The department completed a much-needed revision of its curriculum and added several modern courses to both undergraduate and graduate offerings. The move to Jordan Hall, along with the
technical support provided by two new classified technicians, has given both teaching and research programs new impetus. Sponsored research activities included (1) studies of bird-aircraft collisions (AFOSR), (2) water quality and lake ecology (WRRI), and (3) drinking water and nematodes (EPA). Funds were also approved to continue nutrient cycling studies at the Coweeta Hydrologic Laboratory (NSF).

GRADUATE STUDIES AND UNIVERSITY RESEARCH

The Graduate School

Graduate student enrollment in the fall semester was nearly constant in relation to 1975. Total enrollment was 2,353 with 200 in doctoral programs, 548 in Master of Arts and Master of Science degree programs, 1,022 in professional masters' degree programs, 27 in the educational specialist degree program and 556 students with undeclared majors. In addition, 150 students were enrolled in the Clemson-Furman Master of Business Administration program. A total of 715 advanced degrees were awarded during the year, 35 of which were Doctor of Philosophy degrees.

A new program, the Master of Science in Animal and Food Industries, was implemented in January 1977. This interdepartmental program combines the Master of Science degrees which formerly existed in the areas of animal science, dairy science, and poultry science and is broadened to include the Department of Food Science.

A workshop for graduate student advisors was initiated in August 1976 and has proven to be beneficial in helping advisors discharge this most important duty. The workshop will be sponsored annually by the Graduate School Staff.

Under the advice and direction of the Public Relations Office, the Graduate School Announcements has undergone significant revision. A new method of production accompanied by a consistency in style and editing of courses has led to a reduction in cost. As a consequence, the Announcements will be published each year.

Office of University Research

The primary mission of this office is to provide information and to assist faculty, departments, colleges, and other administrative units with any aspect of the University research effort.

The Institute of Ecology has recently been added to the list of national and regional organizations, offices and programs with
which this office serves as university liaison. Others include the Oak Ridge Associated Universities; the Department of Health, Education and Welfare (HEW); Office of Protection from Research Risk; the HEW Laboratory Animal Welfare Office; and the South Carolina Sea Grant program. The Office also serves as the executive arm of the University Research Council, the University Committee for Laboratory Animal Welfare, the Faculty Research Committee and the University Committee for the Protection of Human Subjects.

Efforts devoted to assisting with human subject activities and to individual faculty members requesting research assistance increased markedly during the year. The proposed University Copyright Policy draft was revised as was the initial draft of the University Animal Facility Policy. The latter revision reflects the occupancy of one newly constructed facility and the anticipated occupancy of another.

A patent information file was initiated, reflecting increased faculty interest in this area.

**Computer Center**

Controlled expansion of service characterizes the Computer Center's activity. A more powerful primary computer and a research computing system were acquired; information storage capacity was enlarged; reliability of the power supply was increased; additional terminals were installed; user capabilities were expanded through acquisition of new software and improvement of that already in use. A seven-year contract with the Department of Social Services for major data processing support was ratified. And the center's office area was renovated, with tangible benefits to the efficiency of users and staff.

Installation in December of an IBM System 370/165-II (replacing the 370/158) almost tripled computing capacity, allowing the center to increase its support of other state agencies while substantially improving the general level of service to on-campus users. The result was a marked reduction of turnaround time and expansion of time-sharing capability, now providing effective response to 100 simultaneous users. To keep pace with the demand from both academic and administrative areas for more data storage, the number of disk spindles was doubled and a magnetic drum storage device was added.

Installation of an uninterruptible power supply has ended the problem of power surges that hampered system performance, and has effectively forestalled power outages.
An IBM Series I minicomputer was installed in June. This machine, the first of several to be added to the Clemson system, will be used primarily for research and development, with the ultimate goal of reducing the processing load of the main computer.

Several text editing and formatting programs acquired from commercial vendors and other installations have been interfaced with similar high-performance software developed by the center's academic computing group, providing users with great flexibility and convenience in the creation, modification, and publication of datasets.

Division of Information Systems Development

The Division of Information Systems Development (DISD) was established in 1974 to provide skilled assistance to governmental agencies in the design, implementation and maintenance of computerized information systems. During the year this division continued to provide vigorous assistance and support to the special needs of the University and other governmental agencies as a back-up support for state government.

Contracts during the year included:

Appalachia II Districts Health Department—Maintenance on the system developed to handle health care and appointment requirements of the department was performed.

Division of Administration-Office of the Governor—Maintenance and refinement continued on a system to maintain records for persons trained under the Comprehensive Manpower Program.

Department of Social Services—Seven areas of support were entered into with DSS in its growing computer information system requirements.

(1) Education and Training—Stressed programming techniques, database management, and interactive program development.

(2) Management Accounting and Control System—Began initial analysis in the conversion of this accounting system from the state of Mississippi.

(3) IV-D—Nearly completed a system for child support enforcement, including data capture and payment distribution.

(4) Clemson Conversion—Participated in the conversion of all current systems to the Clemson system. This process is now complete.

(5) Title XX—Placed the system developed by DISD under production control, implemented a statistical sampling system and replaced the data capture system.
(6) Project Control System—Evaluated and selected a system to meet the needs of Clemson University and DSS.

(7) Management Information System—Participated in service analysis and system cross match to begin development of a comprehensive Management Information Service for the department.

Energy Management Office—Helped produce reports on natural gas users and suppliers in the State on a system previously developed by DISD.

IPTAY—Developed and implemented a system to keep records on Clemson University IPTAY members, their contributions and their benefits.

Mental Health Centers—Continued maintenance and development on a system for maintaining patient and staff records.

Lander College—Continued development and support of Lander's data processing needs in student and alumni records, payroll and course-load prediction.

Plant Pesticides Regulatory Service—Maintained and enhanced a system which maintains records of plant pesticides and applicators who are licensed to use them.

Division of Administrative Programming Services

The Division of Administrative Programming Services (DAPS) is responsible for the creation and maintenance of information systems which meet the needs of the University administration. These fall into two major categories:

- Operational information systems which support the routine operation of the University. These systems provide an up-to-date university database of accurate operational information.
- Management information systems which can help university executives evaluate the consequences of alternative decisions. These systems use the information from the University database created by operational systems.

Operational Information Systems

During the year DAPS implemented these new operational information systems:

1. A Personnel/Payroll database system for on-line inquiry by various departments.
2. An Affirmative Action goal setting, tracking and reporting system.
Management Information Systems

All program modules of the program costing software acquired from the National Center for Higher Education Systems (NCHEMS) have been implemented on a pilot basis. DAPS will begin consulting with key university administrators to refine the costing model and tailor it to the University's specific needs. The first phase of management reports are scheduled for completion in September of 1977.

The initial general design of extensions and additions to the NCHEMS model will begin soon. The goal will be to determine the number of additional students that can be accommodated with existing facilities; the number of additional students in a given major that can be accommodated with existing faculty; and the impact curriculum changes would have on the courses and majors affected, the required staffing levels, the University budget and office and classroom space requirements.

Administrative Programming Services is rapidly approaching a shift in its efforts from major new development of operational systems to the analysis, design, and implementation of management information systems. Within the fiscal year the student database is expected to be fully operational; this, together with the financial database implemented two years ago, provides the nucleus information necessary to support management reporting.

ROBERT MULDROW COOPER LIBRARY

The Robert Muldrow Cooper Library continues to grow and follow as closely as possible its primary purpose of acquiring, preserving and making available for use those publications which will support the educational and research programs of Clemson University. The success of this 17-year-old policy has been attested to in the recent report of the South Carolina Commission on Higher Education:

"One is impressed with how well the Clemson library has carried out its purpose as approved by the Board of Trustees in 1960 ... That is why the Clemson library appears to this surveyor as being not an outstanding or distinguished research library, but as being that rarity among university libraries, one which has attempted to tailor its collections precisely to the educational programs."

The following statistics indicate the strength of the collection. Serials titles which include journals, publications of societies in English and many foreign languages, 12,002, an increase of 714 titles over last year; reels of microfilm, 16,600; units of microfiche, 263,874; microcards, 31,504. The library now contains 650,682 volumes.

To supplement the collection, 2,337 items were borrowed from other libraries on interlibrary loan and 2,165 Clemson items were loaned. The Science, Technology and Agriculture Division cooperated with the National Agricultural Library in collecting and microfilming a copy of all available South Carolina Agricultural Experiment Station, South Carolina Agriculture Extension Service and the Clemson University College of Agriculture publications from 1888-1969. This project should be completed soon.

In February the Circulation Department changed from an automated circulation system utilizing the IBM 1030 system to the new, technologically advanced IBM 5230 Data Collection system. As with the 1030 system, Clemson may well be the first library in the nation to use this new system.

Major changes in the library administration organization were authorized during the year, effective July 1. The new position of associate director and the division of the responsibilities of the head of the Social Sciences and Humanities Division position into separate areas of reference and circulation should provide for greater specialization of duties and for more efficient total operation.

Plans were developed to strengthen information sources in the Science, Technology and Agriculture Division with the addition of an on-line bibliographic search service. The library would then be able to query a data base and receive sources of information from 60 or more indexing and abstracting services within minutes, instead of the traditional manual method of searching. The administration will consider the new method early in the new academic year.

Completion in the fall of 1977 of construction of the second tier of stacks in the Science, Technology and Agriculture Division will more than double shelves available for books and provide reading stations for 100 students. Construction of the final phase of library expansion is expected to begin in the fall. The project will include construction of an intermediate floor between the ground floor and the basement for use by the Social Science and Humanities Division, and completion of the basement itself.
STUDENTS

The 1976-77 academic year marked the 22nd of uninterrupted growth in Clemson enrollment, but the 0.2 per cent increase was smaller than in recent years in keeping with the Board of Trustees' goal of limiting on-campus enrollment to approximately 10,000 full-time students. A total 11,383 students registered for classes—9,079 full-time and 1,210 part-time students on-campus and the remaining 1,094 in various off-campus programs. Of total enrollment 2,763 were graduate students. Physical limitations are a primary reason for limiting enrollment, along with an insistence on maintaining the quality of Clemson education and the person-to-person character of the educational experience at the University.

Computerized preregistration helped the record number of students get off to a smooth start for fall classes. About 94 per cent were preregistered and had their course schedules completed before they arrived on campus to begin classes.

The new school year saw some shifts in on-campus enrollment among the University's nine colleges. The College of Education, number one in enrollment in 1975-76, was replaced at the top by the College of Industrial Management and Textile Science, which had 1,748 students enrolled, and by the College of Engineering with 1,692 students, followed in order by Education, Sciences, Agricultural Sciences, Liberal Arts, Forest and Recreation Resources, Architecture and Nursing. Agriculture had the largest percentage increase with 14 per cent. Engineering grew 12 per cent and Industrial Management and Textile Science, 7 per cent. Nursing remained at about the same level and the other colleges decreased slightly in enrollment.

Students returning to campus found the cost of their education had increased. To help meet continuing shortfalls in state appropriations, the Board of Trustees approved in June 1976 a $25 hike in tuition fees for in-state students and a $75 increase for non-residents. In addition, the cost of food service went up $10 a semester and dormitory rental increases from $5 to $35 were in effect (auxiliary services like food service and housing must by state law be self-supporting).

Extracurricular activities throughout the year continued to exemplify the character and accomplishments of the student body. Forty-two students were selected for "Who's Who Among Students in American Universities and Colleges," 18 represented Clemson at
the State Student Legislature, and 10 attended the annual mock
United Nations at Harvard University.

Some 250 academically outstanding Sigma Tau Epsilon members
gave their time to tutor other Clemson students with academic
problems. Clemson debaters won half the national honors at a de­
bate tournament among some 50 colleges and universities at the
University of Tennessee.

The student chapter of the American Society of Civil Engineers
won a Certificate of Commendation for its outstanding activities
in the region, and the student chapter of the American Institute of
Chemical Engineers was selected the 1976 Outstanding Chapter in
the Southern Regional Conference of Student Chapters, which in­
cludes 18 schools in 10 southern states.

Clemson students collected money for charities with muscular
dystrophy bathtub and kite-flying marathons, for UNICEF in a
marathon soccer game, for multiple sclerosis with a volleyball mara­
thon, and paid for and attended a Clemson - University of North
Carolina football game with about 20 boys from the Clinton, S. C.,
Thornwell Orphanage. Student nurses volunteered their time and
skills to participate in a blood pressure screening for area elemen­
tary school students.

The student-operated University Speakers Bureau brought noted
lecturers to campus, including former CIA director William Colby,
journalist Morley Safer, author George Plimpton and Mel Blanc,
"the voice of Bugs Bunny." The Clemson Players drama troupe per­
formed "George M," "Our Town," "The Madwoman of Chaillot" and
other plays to packed houses in Daniel Hall Auditorium.

Like extracurricular activities, academic excellence continued to
characterize the Clemson student body. More than 93 per cent of
the entering freshman class for 1976-77 graduated in the top half
of their high school classes, up from 91 per cent the year before.
More than 37 per cent were in the top 10 per cent, up from 32 per
cent. While average Scholastic Aptitude Test (SAT) scores dropped
nationally, scores for freshmen entering Clemson continued to rise.
The average SAT score for Clemson freshmen is now almost 100
points above the national average.

Fall 1977 enrollment figures were not available as this report was
written, but the on-campus total was expected to be about 10,500
(9,350 full-time and 1,150 part-time). High school students are ap­
plying to Clemson much earlier than ever before. By January 1977,
applications were running 70 per cent ahead of a year before. Enough prospective students had applied by then to fill all dormitory space reserved for new students.

Of 5,334 new applications for admission for 1976-77, 3,670 were accepted and 2,433 actually enrolled (including freshmen and transfer students). South Carolina residents account for 78 per cent of the 11,383 Clemson students, including those enrolled in off-campus programs.

The University awarded 2,559 degrees during academic year 1976-77.

Fall semester enrollment comparisons for recent years are shown below:

**Fall Semester Enrollment Comparisons**

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergraduate</th>
<th>Graduate and others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968-69</td>
<td>6,165</td>
<td>674</td>
<td>6,839</td>
</tr>
<tr>
<td>1969-70</td>
<td>6,203</td>
<td>818</td>
<td>7,021</td>
</tr>
<tr>
<td>1970-71</td>
<td>6,679</td>
<td>1,359</td>
<td>8,038</td>
</tr>
<tr>
<td>1971-72</td>
<td>7,300</td>
<td>1,590</td>
<td>8,890</td>
</tr>
<tr>
<td>1972-73</td>
<td>7,686</td>
<td>2,071</td>
<td>9,757</td>
</tr>
<tr>
<td>1973-74</td>
<td>7,910</td>
<td>2,202</td>
<td>10,112</td>
</tr>
<tr>
<td>1974-75</td>
<td>8,171</td>
<td>2,415</td>
<td>10,586</td>
</tr>
<tr>
<td>1975-76</td>
<td>8,576</td>
<td>2,785</td>
<td>11,361</td>
</tr>
<tr>
<td>1976-77</td>
<td>8,620</td>
<td>2,763</td>
<td>11,383</td>
</tr>
</tbody>
</table>

The 1976-77 figures include 939 students attending off-campus institutes and 155 in the Clemson-Furman University Master of Business Administration degree program.

Clemson students come from all 46 South Carolina counties, 43 states, Puerto Rico, the Canal Zone, the District of Columbia, and 42 foreign countries (170 students).

Enrollment of women at Clemson reached an all-time high during the 1976 fall semester. There were 4,349, of which 3,089 were undergraduates on the campus. Enrollment of undergraduate coeds increased about 5 per cent over last year. Women students now constitute 36 per cent of on-campus enrollment and about 38 per cent of total enrollment.

The Clemson student body continues to be a working group who receive a significant amount of financial assistance in the form of loans, scholarships and other financial assistance. In 1976-77 ap-
proximately 2,550 students earned an estimated $3,320,145 from working for the University, a figure that does not include earnings from off-campus employment. Clemson awarded 271 long-term loans totalling $194,783. The University also approved and certified 387 guaranteed student loans from a variety of lending institutions. Excluding athletic grants-in-aid and donor-selected scholarships, 1,122 scholarships and grants, valued at $834,569 were awarded. In all, approximately 40 per cent of the student body received financial assistance administered by Clemson. It is estimated that 60 per cent of the student body received aid from scholarships, grants, athletic grants-in-aid, loans, on-campus student employment, veterans aid, Social Security and rehabilitation benefits totalling about $6.1 million during academic year 1976-77.

Additional tabular information about Clemson's student body is given on the charts that follow.
## Fall Semester 1976 Enrollment by Colleges, and Degrees Awarded
### December 1975 - August 1976

<table>
<thead>
<tr>
<th>College</th>
<th>Fall Semester</th>
<th>Enrollment</th>
<th>Associate</th>
<th>Bachelor's</th>
<th>Master's</th>
<th>Specialist</th>
<th>Doctorates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>1,053</td>
<td>0</td>
<td>124</td>
<td>41</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>177</td>
</tr>
<tr>
<td>Architecture</td>
<td>526</td>
<td>0</td>
<td>126</td>
<td>47</td>
<td>0</td>
<td>0</td>
<td>173</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>1,555</td>
<td>0</td>
<td>378</td>
<td>437</td>
<td>14</td>
<td>0</td>
<td>829</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>1,692</td>
<td>0</td>
<td>185</td>
<td>71</td>
<td>0</td>
<td>10</td>
<td>266</td>
<td></td>
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<tr>
<td>Forest &amp; Rec. Resources</td>
<td>800</td>
<td>0</td>
<td>164</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>178</td>
<td></td>
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<tr>
<td>Ind. Mgt. &amp; Text. Science</td>
<td>1,748</td>
<td>0</td>
<td>292</td>
<td>16</td>
<td>0</td>
<td>7</td>
<td>315</td>
<td></td>
</tr>
<tr>
<td>Liberal Arts</td>
<td>999</td>
<td>0</td>
<td>216</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>241</td>
<td></td>
</tr>
<tr>
<td>Nursing</td>
<td>520</td>
<td>36</td>
<td>77</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>Sciences</td>
<td>1,363</td>
<td>0</td>
<td>202</td>
<td>52</td>
<td>0</td>
<td>13</td>
<td>267</td>
<td></td>
</tr>
<tr>
<td>Non-degree</td>
<td>1,363</td>
<td>0</td>
<td>202</td>
<td>52</td>
<td>0</td>
<td>13</td>
<td>267</td>
<td></td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>10,289</strong></td>
<td><strong>36</strong></td>
<td><strong>1,764</strong></td>
<td><strong>703</strong></td>
<td><strong>14</strong></td>
<td><strong>42</strong></td>
<td><strong>2,559</strong></td>
<td></td>
</tr>
</tbody>
</table>

Degrees awarded since 1896 total 34,973 of which 231 4,727 master’s degrees; 36 education specialist degrees; have been associate degrees; 29,544 bachelor’s degrees; and 435 doctorates.
### Number and Per Cent of Black Students

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td>179</td>
<td>2</td>
</tr>
<tr>
<td>1973</td>
<td>211</td>
<td>2</td>
</tr>
<tr>
<td>1974</td>
<td>216</td>
<td>2</td>
</tr>
<tr>
<td>1975</td>
<td>338</td>
<td>3</td>
</tr>
<tr>
<td>1976</td>
<td>307</td>
<td>3</td>
</tr>
</tbody>
</table>

### Student-Faculty Ratio (Full-Time Equivalent)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>12.6 : 1</td>
</tr>
<tr>
<td>1970</td>
<td>13.1 : 1</td>
</tr>
<tr>
<td>1971</td>
<td>14.6 : 1</td>
</tr>
<tr>
<td>1972</td>
<td>14.6 : 1</td>
</tr>
<tr>
<td>1973</td>
<td>16.8 : 1</td>
</tr>
<tr>
<td>1974</td>
<td>17.9 : 1</td>
</tr>
<tr>
<td>1975</td>
<td>18.3 : 1</td>
</tr>
<tr>
<td>1976</td>
<td>17.6 : 1</td>
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</table>

### Average College Board Score of Freshmen

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
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</thead>
<tbody>
<tr>
<td>1960</td>
<td>998</td>
</tr>
<tr>
<td>1965</td>
<td>1003</td>
</tr>
<tr>
<td>1966</td>
<td>995</td>
</tr>
<tr>
<td>1967</td>
<td>1005</td>
</tr>
<tr>
<td>1968</td>
<td>1005</td>
</tr>
<tr>
<td>1969</td>
<td>1015</td>
</tr>
<tr>
<td>1970</td>
<td>1005</td>
</tr>
<tr>
<td>1971</td>
<td>997</td>
</tr>
<tr>
<td>1972</td>
<td>995</td>
</tr>
<tr>
<td>1973</td>
<td>982</td>
</tr>
<tr>
<td>1974</td>
<td>984</td>
</tr>
<tr>
<td>1975</td>
<td>983</td>
</tr>
<tr>
<td>1976</td>
<td>996</td>
</tr>
</tbody>
</table>
### Number of Teachers
(Full-Time Equivalent Teaching Faculty)

<table>
<thead>
<tr>
<th>Year</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>571.2</td>
</tr>
<tr>
<td>1971</td>
<td>580.1</td>
</tr>
<tr>
<td>1972</td>
<td>614.8</td>
</tr>
<tr>
<td>1973</td>
<td>578.4</td>
</tr>
<tr>
<td>1974</td>
<td>591.8</td>
</tr>
<tr>
<td>1975</td>
<td>602.5</td>
</tr>
<tr>
<td>1976</td>
<td>611.3</td>
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</table>

### Number In Freshman Class
(New Students)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>640</td>
</tr>
<tr>
<td>1960</td>
<td>1,363</td>
</tr>
<tr>
<td>1965</td>
<td>1,479</td>
</tr>
<tr>
<td>1966</td>
<td>1,388</td>
</tr>
<tr>
<td>1967</td>
<td>1,559</td>
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<td>1968</td>
<td>1,632</td>
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<td>1969</td>
<td>1,468</td>
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<td>1970</td>
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<td>1971</td>
<td>1,853</td>
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<td>1972</td>
<td>1,919</td>
</tr>
<tr>
<td>1973</td>
<td>2,034</td>
</tr>
<tr>
<td>1974</td>
<td>1,949</td>
</tr>
<tr>
<td>1975</td>
<td>1,901</td>
</tr>
<tr>
<td>1976</td>
<td>1,861</td>
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## Acceptance Rate of Applicants

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>79%</td>
</tr>
<tr>
<td>1968</td>
<td>79</td>
</tr>
<tr>
<td>1969</td>
<td>79</td>
</tr>
<tr>
<td>1970</td>
<td>87</td>
</tr>
<tr>
<td>1971</td>
<td>87</td>
</tr>
<tr>
<td>1972</td>
<td>83</td>
</tr>
<tr>
<td>1973</td>
<td>83</td>
</tr>
<tr>
<td>1974</td>
<td>84</td>
</tr>
<tr>
<td>1975</td>
<td>77</td>
</tr>
<tr>
<td>1976</td>
<td>69</td>
</tr>
</tbody>
</table>

## Retention Rate of Students (Freshman Class)

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>77%</td>
</tr>
<tr>
<td>1966</td>
<td>79</td>
</tr>
<tr>
<td>1967</td>
<td>76</td>
</tr>
<tr>
<td>1968</td>
<td>80</td>
</tr>
<tr>
<td>1969</td>
<td>82</td>
</tr>
<tr>
<td>1970</td>
<td>78</td>
</tr>
<tr>
<td>1971</td>
<td>84</td>
</tr>
<tr>
<td>1972</td>
<td>82</td>
</tr>
<tr>
<td>1974</td>
<td>83</td>
</tr>
<tr>
<td>1975</td>
<td>83</td>
</tr>
<tr>
<td>1976</td>
<td>83</td>
</tr>
</tbody>
</table>
### Number of On-Campus Students in Summer School

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>948</td>
</tr>
<tr>
<td>1960</td>
<td>1,015</td>
</tr>
<tr>
<td>1965</td>
<td>3,216</td>
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<td>1966</td>
<td>3,539</td>
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<td>1967</td>
<td>3,980</td>
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<td>1968</td>
<td>4,820</td>
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<td>1969</td>
<td>4,472</td>
</tr>
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<td>1970</td>
<td>4,428</td>
</tr>
<tr>
<td>1971</td>
<td>4,692</td>
</tr>
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<td>1972</td>
<td>5,232</td>
</tr>
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<td>1973</td>
<td>6,267</td>
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<td>1974</td>
<td>5,997</td>
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<td>1975</td>
<td>6,886</td>
</tr>
<tr>
<td>1976</td>
<td>6,287</td>
</tr>
<tr>
<td>1977</td>
<td>6,674</td>
</tr>
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</table>

### Number of Dorm Beds and Per Cent Being Utilized

<table>
<thead>
<tr>
<th>Year</th>
<th>Beds</th>
<th>Per Cent Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>2,900</td>
<td>100</td>
</tr>
<tr>
<td>1965</td>
<td>3,624</td>
<td>97</td>
</tr>
<tr>
<td>1966</td>
<td>3,920</td>
<td>99</td>
</tr>
<tr>
<td>1967</td>
<td>4,348</td>
<td>97</td>
</tr>
<tr>
<td>1968</td>
<td>4,780</td>
<td>95</td>
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<td>1969</td>
<td>4,764</td>
<td>94</td>
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<td>1970</td>
<td>5,190</td>
<td>93</td>
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<td>1971</td>
<td>5,174</td>
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<td>1972</td>
<td>5,174</td>
<td>100</td>
</tr>
<tr>
<td>1973</td>
<td>5,330</td>
<td>102</td>
</tr>
<tr>
<td>1974</td>
<td>5,592*</td>
<td>101</td>
</tr>
<tr>
<td>1975</td>
<td>5,616**</td>
<td>103</td>
</tr>
<tr>
<td>1976</td>
<td>5,625†</td>
<td>103</td>
</tr>
<tr>
<td>1977</td>
<td>5,662‡</td>
<td>103</td>
</tr>
</tbody>
</table>

* Includes 252 beds in the Clemson House.
** Includes 262 beds in the Clemson House.
† Includes 271 beds in the Clemson House.
‡ Includes 308 beds in the Clemson House.
CURRENT OPERATING FUNDS

Revenues and Additions by Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Fees</td>
<td>$5,887,920</td>
<td>7.62%</td>
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<tr>
<td>State Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational and General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$28,087,843</td>
<td>36.35%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$14,020,315</td>
<td>18.15%</td>
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<td>Federal Appropriations:</td>
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<td></td>
</tr>
<tr>
<td>Educational and General (Morrill-Nelson)</td>
<td>$121,373</td>
<td>1.62%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$6,840,663</td>
<td>8.83%</td>
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<tr>
<td>Sales and Services of Educational Departments</td>
<td>$1,194,773</td>
<td>1.55%</td>
</tr>
<tr>
<td>Miscellaneous Sources</td>
<td>$2,200,325</td>
<td>2.85%</td>
</tr>
<tr>
<td>Endowment Income</td>
<td>$67,621</td>
<td>0.09%</td>
</tr>
<tr>
<td>Sales and Services of Auxiliary Enterprises</td>
<td>$1,191,319</td>
<td>1.55%</td>
</tr>
<tr>
<td>Federal Grants and Contracts</td>
<td>$820,089</td>
<td>1.05%</td>
</tr>
<tr>
<td>State Grants and Contracts</td>
<td>$97,636</td>
<td>0.13%</td>
</tr>
<tr>
<td>Local Grants and Contracts</td>
<td>$1,191,400</td>
<td>14.64%</td>
</tr>
<tr>
<td>Private Gifts, Grants, and Contracts</td>
<td>$3,551,598</td>
<td>4.53%</td>
</tr>
<tr>
<td><strong>TOTAL REVENUES AND ADDITIONS</strong></td>
<td>$77,259,725</td>
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</tbody>
</table>

Brought forward from 1975-76 for:

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encumbrances and Restricted Funds Balance</td>
<td>4,536,623</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL FUNDS AVAILABLE</strong></td>
<td>$81,796,348</td>
<td></td>
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</tbody>
</table>

Expenditures by Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$17,119,393</td>
<td>22.39%</td>
</tr>
<tr>
<td>Research—Departmental</td>
<td>$4,398,604</td>
<td>5.75%</td>
</tr>
<tr>
<td>Research—Agricultural Experiment Station</td>
<td>$2,947,265</td>
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</tr>
<tr>
<td>Extension and Public Service—Cooperative</td>
<td>$11,320,604</td>
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</tr>
<tr>
<td>Agricultural Extension Service</td>
<td>$2,700,296</td>
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<tr>
<td>Extension and Public Service—Regulatory Service</td>
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<tr>
<td>Academic Support</td>
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<td>Student Services</td>
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<tr>
<td>Institutional Support</td>
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<tr>
<td>Operation and Maintenance of Plant</td>
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<td>14.64%</td>
</tr>
<tr>
<td>Auxiliary Enterprises</td>
<td>$802,693</td>
<td>1.05%</td>
</tr>
<tr>
<td>Scholarships and Fellowships</td>
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</tr>
<tr>
<td><strong>TOTAL EXPENDITURES</strong></td>
<td>$76,444,675</td>
<td>100.00%</td>
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</tbody>
</table>

**TOTAL EXPENDITURES, TRANSFERS AND OTHER DEDUCTIONS** $78,244,750

Balance, 6/30/77 for Encumbrances and Restricted Funds Balance 3,551,598

**TOTAL EXPENDITURES AND BALANCE** $81,796,348
### Student Aid Funds
#### Fiscal Year 1976-77

**Revenue**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans and Interest Payments</td>
<td>$94,339.92</td>
</tr>
<tr>
<td>Gifts/Grants for Scholarships, Grants, Fellowships, Other Stipends</td>
<td>$1,456,198.46</td>
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<tr>
<td>Endowment Income</td>
<td>$82,089.96</td>
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<tr>
<td>Investment Income</td>
<td>$90,561.58</td>
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<tr>
<td>Other Income</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$1,725,356.92</strong></td>
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**Disbursements**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Loans</td>
<td>$196,029.50</td>
</tr>
<tr>
<td>Grants for Scholarships, Fellowships and Special Purpose Stipends (Including Grants-in-Aid)</td>
<td>$802,193.12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$998,222.62</strong></td>
</tr>
</tbody>
</table>
The College of Agricultural Sciences administers state-wide public service programs in addition to its program for Resident Instruction. Among its public service functions are administration and coordination of the varied activities and services of the South Carolina Agricultural Experiment Station, the Cooperative Extension Service, the Division of Regulatory and Public Service Programs, and the Livestock-Poultry Health Department. Reports for these divisions follow.

**SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION**

*W. Cecil Godley, Director*

The only program of agricultural research funded by the State of South Carolina is conducted by the S. C. Agricultural Experiment Station. Its statewide system of research stations is administered from the College of Agricultural Sciences at Clemson University.

Agricultural researchers today face the challenge of feeding and clothing a growing world population. Producing more food and fiber per acre of cultivated land, marketing products more efficiently, making the most of precious natural and human resources, all are goals of research. S. C. Experiment Station scientists respond to changing needs in the State by working in areas that will help farmers, agribusiness interests and consumers alike to receive better and more abundant goods and services.

They believe that cooperation is the key to success in research, so Station scientists take an interdisciplinary approach to problem-solving. They also cooperate with other State and Federal agencies in sharing and disseminating information. The Station operated under State control with annual State appropriations supplemented by Federal appropriations. The South Carolina Experiment Station has a counterpart in every state.

Ten departments in the College of Agricultural Sciences participate in the research program of the Station. Home economists research is conducted at Winthrop College. Branch Stations include the Sandhill Station at Pontiac, the Pee Dee Station at Florence,
the Edisto Station at Blackville, the Truck Station at Charleston and the Coast Station at Summerville.

The Experiment Station was established at Clemson in 1889 under federal laws.

**Highlights and Accomplishments**

It is difficult to choose a few projects from a broad research effort to highlight. The ones selected from the total program of the South Carolina Agricultural Experiment Station can serve only as a glimpse into its activities during the period from July 1, 1976, to June 30, 1977.

**Agricultural Economics and Rural Sociology**

The goal of economists and sociologists is to find the best ways to understand, develop and use South Carolina's human and natural resources.

Considerable research this year related to animal agriculture. One study indicated that the South Carolina dairy processing industry is not operating from a least-cost position and that move toward fewer, but larger, processing plants would decrease total costs and perhaps also lower consumer prices.

An analysis of the dairy industry's role in the total economy of the State showed that for every dollar change in final demand for all dairy farm products, there would be a $1.54 change in the State's output. A dollar change in the final demand for fluid milk only causes a $2.13 change in output in the economy. As South Carolina imported more than 32 million dollars in out-of-state dairy farm products, it would seem there is great potential for increased milk production in the State. Each dollar increase in fluid milk sales will increase the total output in the State by more than two dollars. Institutional factors appear to be limiting this increase; therefore, additional research has begun on the competitive position of South Carolina milk producers.

In another study researchers gathered information on the investment needs and operating costs per ton of feed for mills of various sizes and types. This information is helpful to managers who are comparing operating costs and considering large investments in feed mill equipment.

Energy received extensive attention this year. Almost 80 per cent of the energy used in the fiscal year 1973-74 by South Carolina manufacturers came from natural gas. With precarious out-of-state
supplies of natural gas, the South Carolina economy is highly vul-
nerable to uncontrollable forces affecting the natural gas industry.
Research indicates there is a large potential for energy savings by
reducing the energy intensity (BTU/dollar of output) of relatively
new establishments. If the bottom 20 per cent of firms increased
their energy intensity (became more efficient) to the level of the
most energy efficient firm in that category, the potential energy sav-
ing was found to exceed 85 per cent.

The savings potential is obvious. But investment in new equip-
ment or techniques required to obtain these savings is unknown.

Sociologists studied the employment characteristics of female
graduates of Clemson between 1963 and 1974. Seventy-eight per
cent of the graduates were employed, and three-fourths of them
were working in jobs related to their college major. Low salaries
and opportunities for advancement were points of greatest dissatis-
faction. Those graduating in fields typically dominated by males
earned larger salaries.

Agricultural Engineering

Major research accomplishments have been achieved in several
ongoing agricultural engineering programs this year, and new re-
search has begun in other areas.

Clemson University has signed a licensing agreement with Uni-
versal Manufacturing and Supply Company of Aiken for manu-
facture of the fresh market tomato harvester developed by the De-
partment of Agricultural Engineering. One unit has been con-
structed and shipped to tomato growers in Australia.

The principle of plant uprooting by means of a rotating square
bar has been incorporated into a cultivating system for vine crops.
This principle was developed for use with the tomato harvester,
but preliminary field tests during the past year indicated that it
could be used very effectively in a cultivating system. The new
system should allow mechanical cultivation to continue much longer
into the season than is possible with present cultivating systems.

Tests have continued with the two fruit harvesters previously
developed. However, the major emphasis during the past year was
devoted to the development of a fruit handling, bin filling system.
This system is mounted on a tractor and bin trailer which follows
the harvester through the orchard. It handles the fruit with ac-
ceptable levels of damage and is also compatible with the types of
tractors and bin trailers presently being used by commercial peach producers.

A new system for incorporating herbicides and planting row crops such as corn, cotton, and soybeans has been developed. The current system, when compared with the conventional method, reduces the number of trips over a field from six to three. This is beneficial from both energy conservation and soil compaction standpoints. Weed control with the new system has consistently been as good as or better than conventional systems.

Commercial development of the once-over tobacco harvester has allowed the research efforts of the Department of Agricultural Engineering to shift more intensively to the tobacco curing process. Both mechanical harvesting and bulk curing have made it necessary to intensify curing research in order to consistently produce uniform tobacco of high quality.

New research activities include a solar hot water heater for human residences, which is undergoing tests in cooperation with USDA’s Rural Housing Research Unit at Clemson. Modular-type construction allows its size to be adapted to the needs of the particular residence it serves.

Solar energy in conjunction with energy efficient units such as a heat pump is being investigated for grain drying. Other drying applications on a farmstead will be studied, because the capital investment for a solar unit would make it necessary for the unit to be used as much as possible.

Research on plant modeling continued with major emphasis on a model of root growth and nutrient and water uptake and a soybean plant model. Other uses of computers in agriculture also are being investigated. A new research project to develop a computer-based automatic control system for a combine was initiated, and a computer-based data acquisition system was developed for use as a weather station.

Research also began in the area of agricultural safety. Emphasis will be on safe use of pesticides and safe operation of farm equipment.

Strong research programs continue in the area of agricultural waste management. Land application of poultry waste was investigated to determine its nutrient value for producing sorghum-sudan forage. In addition, research was initiated to determine the best management practices for nonpoint sources of pollution.
Agronomy and Soils

Agronomic researchers continue to make significant practical contributions for improving crop production practices through increased yields for producers and better quality products for the consumer.

Effort is being made to improve control practices for annual broadleaf weed control in soybeans and cotton. Postemergence herbicides with proper surfactants look promising for soybeans. In cotton, emphasis is being placed on hard-to-kill species such as nutsedge, croton, velvetleaf and spurred anoda. Several experimental herbicides give promise for controlling johnsongrass in soybeans.

Official crop variety performance and testing is of much interest to growers and agribusiness. Researchers work each year to identify new adapted varieties that out-perform currently used varieties in yield or quality.

New breeding lines and varieties of small grains, soybeans, corn, cotton, and tobacco crops are being developed to increase resistance against disease and insect pests and responsiveness to improved cultural practices.

Agronomists are evaluating and developing adapted cool-season perennial forage grasses for the Coastal Plain. After extensive screening of 25 grass species, they find that fescue, hardinggrass and immediate wheatgrasses merit further concentrated breeding effort.

Improved fertilization and cultural practices are being developed to help plants use nutrients and water more efficiently. Researchers are studying coarse-textured soils in regard to plant nutrient leaching and accumulation in subsoils. Research utilizes soil testing procedures for assessing availability of nutrients in subsoil for crop response.

Irrigation studies are conducted to determine relationships between cultural practices, growth regulators, and water availability and needs of agronomic crops.

Ways to deactivate, utilize when possible, and monitor wastes and residue chemicals are being examined to improve or maintain environmental quality.

Nitrogen fixation by soybeans is being investigated. Tests are conducted to determine relationships between nematode infestation roots and inoculation of soybeans by nitrogen fixing organisms.
Efficient production of high quality animals continues to be the top priority of animal scientists. Monensin and used corrugated boxes were included in the ration for fattening beef cattle. The Monensin fed cattle gained 6.5 percent faster than the controls on 8.6 percent less feed. The corrugated boxes were fed as a ground material at levels of 0.6 pounds or 1.2 pounds daily.

A recently completed study using various breeds of cattle shows that crossbred cows produce more pounds of calf per cow bred than straightbred cows. This study involved 991 calves. Generally, the breed combination which consisted of one or more large breeds and a small breed produced the most pounds of calf per cow bred per year.

Broiler litter was ensiled in an oxygen-limiting silo and subsequently fed to beef steers drylot. Ensiled broiler litter proved to be an effective feed source, resulting in reducing feed costs. The litter contained a high percentage of true protein nitrogen indicating that it should be a good source of supplemental protein for cattle.

Replacement beef heifers were grazed on tall fescue or orchardgrass with or without Ladino clover. *In vitro* digestibility of forage cellulose and protein was higher when the forages contained clover, but average daily gains were not significantly different.

Analysis of samples of various forages and grain crops indicated that feed crops grown in the eastern and southern portions of the State are likely to be deficient in the element selenium, whereas crops grown in the upper part of the State tend to be marginal to adequate in selenium content.

Beef heifers that were inseminated at 56 or 68 hours after the removal of a progesterone-releasing intravaginal device to control the time of estrus had a 60 percent pregnancy rate. Dairy heifers that were inseminated at 52, 56 or 60 hours after removal of a progesterone-releasing intravaginal device had first service pregnancy rates of 64, 77 and 71 percent respectively. Control heifers receiving no treatment had a 63 percent first service pregnancy rate.

It has been observed from our data that growth rate and the efficiency of converting feed to body weight gain increases substantially in swine as the energy concentration of the feed increases.
These results indicate that the currently published and recom-
mended energy requirements of the pig need to be increased ap-
preciably.

The economic feasibility of cooking corn before it was fed to the
pig was studied. Neither daily gain, feed required to produce a
unit to body weight gain nor carcass value were improved by feed-
ing cooked corn; therefore, equipment and energy for cooking feed-
stuffs cannot be justified if corn is the only feedstuff to be cooked.

The results of feeding high-lysine corn to swine emphasizes its
value as compared to normal corn. Also, when the price is com-
parable, synthetic lysine can be added to swine rations to lower the
amount of protein supplement that is usually fed.

The addition of ferrous sulfate or ferrous carbonate to pig rations
significantly improved the hemoglobin level and packed cell volume
of the pigs which were fed from four to nine weeks of age. How-
ever, growth and feed efficiency were not affected during this feed-
ing period.

Gilts and sows were fed high levels of calcium and phosphorus,
and the results indicate that about 14 per cent more pigs were raised
on the higher levels. This represents about one more pig per litter
weaned.

**Dairy Science**

Producing high quality milk and dairy products, improving re-
productive efficiency and maximizing animal response to various
feeding programs are emphasized in dairy science research pro-
grams.

Increased milk production per cow has necessitated high level
grain feeding. In many cases, this practice has been associated with
various metabolic disorders. The end result of one such disorder
is low milk fat which reduces income to dairymen.

An experiment comparing high concentrate feeding to high for-
age feeding has shown that the high concentrate fed group of ani-
mals had increased ruminal propionate and plasma glucose and
insulin. Propionate may be converted to glucose (gluconeogenesis),
leading to elevated blood glucose levels which would induce greater
insulin secretion. This could lead to a fat formation metabolism and
result in fattening of the animal and reduction of circulating milk
fat precursors.

Twice a day feeding of calves has been a routine practice in many
dairy herds. An experiment to evaluate the effects of fluid intake
and dry matter concentration on scours and water intake of calves fed once a day has shown that feeding a 15 per cent dry matter milk replaced at eight per cent of body weight resulted in the best rate of gain with the least digestive disturbance.

Developing feed supplements for rations containing high levels of urea is a continuing effort. The extremely high cost of protein supplements places a financial burden on dairymen that can be partially offset by including urea in the feed for lactating cows.

Estrus and ovulation was synchronized in 45 dairy heifers by implanting a progesterone releasing device into the vagina and leaving it for 14 days. The heifers were inseminated at 56 hours following removal of the devices. A 70 per cent pregnancy rate was achieved without the need for heat checking.

In attempts to understand causes of embryonic death, researchers are developing techniques for growing young embryos and uterine tissues in the laboratory. Embryos can be grown in the laboratory from a very early stage to a stage equal to that at implantation. Approximately 80 per cent of the young embryos can be grown from the four-cell stage to implantation stage.

Aflatoxins are a group of structurally related toxic metabolites produced by the mold Aspergillus flavus and related species. Since corn represents a major component of concentrates and general feedstuffs for all classes of livestock, the potential exposure risk of farm animals, and through their products the American consumer, to the toxic and carcinogenic properties of the aflatoxins is increasing.

The Department of Dairy Science has initiated a research study on aflatoxin B₁ consumption and the resulting presence and stability of residues in milk and tissues. In initial studies on the effects of feeding chronic low levels of aflatoxin B₁ for periods of 100 days to lactating animals, it was shown that milk production and general health were not adversely affected.

Apparently the dosage levels of AFB₁ in the diet posed no metabolic or toxic stress for any of the animals on trial. Residue levels of AFM₁ in milk increased initially and plateaued early in the trial. With slight variations, this level of excretion was maintained through the entire length of the feeding regime. The major amount of the ingested AFB₁ dose is apparently metabolized and/or excreted through other pathways.
The major importance of this research work is to determine the levels, if any, of M₁ produced and how to minimize their presence as well as eliminate them, once present.

**Entomology and Economic Zoology**

Entomologists explore all means of controlling insect pests. Often they use a mixture of controls for a given crop. Biological control methods are gaining importance because of the impact of chemicals on the growers' pocketbooks and on the environment.

Sometimes it is possible to fight insect pests with disease. All major species of caterpillars that feed on soybeans are affected by at least one type of virus disease. Researchers at Clemson are trying to determine if any of these viruses can be used as microbial insecticides in a pest management program for soybeans.

The viruses under study have several advantages over chemical insecticides: they are selective in their action, so they do not harm beneficial insects; they are completely safe to handle; and they leave no harmful residues in the environment.

One such virus, a commercial preparation of the bollworm virus (Elear), has been found effective in reducing heavy populations of bollworms on soybeans. Another virus, which kills the velvetbean caterpillar, was found in Brazil and brought to the Edisto Station for testing. Laboratory tests showed that the virus also kills budworms, bollworms, and cabbage and soybean loopers at higher dosages. In small plot field tests, the virus was effective in reducing populations of the velvetbean caterpillar. Entomologists think perhaps it may be successfully introduced into the soybean environment as a permanent self-sustaining control agent.

Fisheries biologists have done much research in recent years in an area traditionally ignored or avoided in the southern United States. The American eel has great commercial value in the Northeast, Canada, Europe and Japan. In fact, demand for eel has increased so rapidly that the Japanese have been importing the fish from America since 1970.

Eel life history studies in South Carolina's Cooper River included data on age and growth, sex ratio and food habits. Researchers found the greatest number of females to be about two feet in length. Males were much smaller, about one foot. The average age was about five years, but some were as old as 15 years. Females outnumbered males 40 to one. Food taken from 257 eels included fish, crustaceans, molluscs and insects with fish the most abundant item.
Toxicity of formalin, malachite green (m.g.) and potassium permanganate were tested on juvenile eels. All three chemicals were safe at concentrations commonly used for therapy or prophylaxis on other fishes.

The disease *Ichthyophthirius* occurs on almost all wild-caught eels, so results of toxicity tests were used to work out a satisfactory treatment. Malachite green alone and with formalin was effective in controlling "Ich," but the combination gave significantly greater survival than m.g. alone. Dylox was useless.

**Food Science**

The importance of human nutrition on physical well-being becomes more evident every decade. Food science researchers learn how we can get the most good from what we eat, or don't eat.

South Carolina's high incidence of chronic heart disease has led researchers to look into the relationship of nutrition to this malady. They are studying the mineral status of individuals in the heart disease-prone areas of the State by analyzing hair samples.

Data on blood pressure, obtained along with the mineral information, indicate a higher than expected incidence of elevated blood pressure.

Bypassing a portion of the small intestine is a procedure used with dangerously obese persons. It results in reduced absorption of nutrients and, as a consequence, loss of weight.

Station food scientists have studied laboratory animals in which the same operation has been performed. Although the surgically modified animals eat about the same amount of feed as normal control animals, they lose weight after the operation. Later, they begin to gain but never equal the weight of the control animals. The surgically modified animals exhibit serious diarrhea after the surgery, but this condition improves with time. Mineral metabolism appears to be altered in the surgically modified animals.

Of further interest is the fact that even though both groups of animals eat the same amount of fat, the surgically modified group excreted up to three times more fat, suggesting a failure of absorption. Interference with fat absorption suggests similar patterns of excretion in regard to the vitamins A, D, E and K. Food scientists hope to relate this information to humans who have had similar surgery.

Steroids are being used by beef producers to increase rate of gain and feed efficiency. Data from various laboratories indicate that certain anabolic agents may cause tumors. Information is needed on
whether estrogens accumulate in tissue and, if so, what length of time is required to deplete the tissue after removal of the estrogen implant.

Researchers developed radioimmunoassay techniques which measure picogram (pg) quantities to measure estrogens in beef tissue. This technique makes it possible to measure estrogens in muscle, kidney and liver. The estrogen level was found to be fourfold greater in liver and kidney tissue than in muscle, with the level in liver and kidney of steers lower than in heifers. Results indicate that a low detectable level of estrogen may accumulate. The rapidity of estrogen elimination has not been determined.

Researchers are looking for packaging methods that will preserve foods and conserve energy at the same time. Materials and processes that avoid requiring foods to be refrigerated in supermarkets, yet keep excellent flavor, seem promising for the future.

Home Economics

Home and family related research is conducted at Winthrop College with projects including career choices of youngsters and older students, child care in rural areas, dietary habits and nutrition, and research with fabrics.

A study in 1969 investigated the factors influencing career choices of deprived children who were then in the fifth and sixth grades. A follow-up study just being completed surveyed the original subjects (now in the eleventh and twelfth grades) to learn how their career plans have changed since 1969. It was learned that planned occupations lowered somewhat as students moved from preadolescence to late adolescence but that overall, career choices still remain probably “unrealistically” high. A new sample of deprived fifth and sixth graders surveyed showed their aspirations to be as high as or higher than those of more affluent youth.

A project was designed to assess the present child care situation in rural areas and small towns in North and South Carolina and to give families in these areas an opportunity to express their needs and preferences. Data were collected from 271 families in North Carolina and 248 families in South Carolina. The data are currently being processed, and a technical bulletin is being written, setting forth the needs of these families and some of the possible resources available for solving their child care problems.

A group of nine and 10-year old girls consisting of 35 moderate-income whites, six low-income whites, six moderate-income blacks and 29 low-income blacks were chosen from third and fourth
graders in public schools in York County. Dietary and social data and measures of nutrition knowledge were obtained by interviews while dental, medical and biochemical data were obtained on the Winthrop campus. Results of the on-campus data collection revealed that all of the girls had (on the average) intakes of less than the Recommended Daily Allowance for thiamine, vitamin B-6 and magnesium. Each of the four groups showed marginal intakes in some other Recommended Daily Allowances. The information derived from the study should be useful to extension workers and nutrition educators for promotion of better dietary choices to meet physical needs.

**Horticulture**

Experiment Station horticulturists work with vegetables, fruits, turfgrasses and ornamentals.

A breeding program with southern peas is designed to develop peas that have the ability to cope with disease, insect and other environmental problems that are inherent in growing this crop in South Carolina. This project has been fruitful and Colossus Southern pea, introduced by the South Carolina Agricultural Experiment Station in 1974, has become one of the most popular varieties grown in North Carolina, South Carolina and Georgia. Large pea size and ease of shelling are the chief attributes that have made this variety popular.

A cooperative sweet potato breeding program was initiated in 1974 between USDA personnel at Charleston and Clemson University personnel.

Three separate open pollinated nurseries serve as the foundation for the program. Two, one designated 'T' and the other 'J' population, consist of widely divergent plant materials collected from throughout the world which are propagated almost exclusively by seed. Two seed nurseries permit greenhouse and field evaluation of potential parent lines in alternate years. The most desirable selections from these nurseries are gradually introduced into the conventional nursery, designated 'polycross nursery,' thereby serving the dual purpose of introducing new genes or gene combinations and reducing inbreeding. Selection C-51 has been approved and released for breeding purposes.

Approximately 10,000 peach seedlings have been evaluated in the peach breeding program over the past seven years. The progeny from various hybrid combinations involved the outstanding varieties currently grown in the State. One cross of Redhaven x Blake
made in 1968 has yielded some notable progeny. One seedling, 68-440, that ripens one week before Redhaven has looked especially good over the past five years and appears worthy of release. This selection possesses a high degree of frost hardiness. The chilling range for this seedling is in the range of 900 hours.

Turfgrass research is designed to improve the turfgrasses and management practices used on turf under the varied conditions that exist in South Carolina. Research with the tall fescues has yielded several strains that are far superior to all others under upper Piedmont conditions. Considerable progress has been made in developing chemical and cultural methods to improve the transition from cool-season to warm-season grasses on overseeded turf areas. The chemicals, pronamide and prosulfalin, have shown some promise in encouraging a more gradual conversion from overseedings back to bermudagrass turf.

Successful tissue culture research with two important foliage plants, ‘Hahni’ snake plant and ‘Emerald Ripple’ peperomia, was realized. Tissue culture is an ultra-rapid propagation method, making it more desirable than conventional propagation methods.

This research also served as the basis of the training for and establishment of a commercial tissue culture operation in South Carolina.

Plant Pathology

Plant pathologists study the diseases of plants and attempt to cut the crop losses of South Carolina growers by finding ways to prevent or cure them.

The diseases of the leaves and pods cause a significant but unmeasured loss to the soybean crop each year in South Carolina. Two or three applications of fungicides to soybeans in late summer have resulted in an average yield increase of about six bushels per acre. This practice appears to be economically feasible when the yield of beans is expected to exceed about 25 bushels per acre and when beans are planted on the same land in successive years without adequate rotation.

Thus, the use of fungicides on soybeans cannot be recommended as a general production practice, but is a practice that should prove profitable to those soybean growers who produce high yields and who plant soybeans on a major percentage of their available land. The practice is being studied to determine its effects on those fungi that parasitize soybean insects and on the insect population.
When certain species of fungi, notably of the fungus genus *Aspergillus*, grow on corn or other food or feed crops, potent toxins are produced. These toxins may cause poor growth or even death of various animals. The toxin producing fungus, *Aspergillus flavus*, which produces a group of toxins called aflatoxins, has been found much less prevalent in nature than was thought. It is commonly associated with corn earworms, however, and the buildup of toxins in corn has been closely associated with damage from corn earworms and from other insects that feed on corn kernels. It is also associated with plant growth stresses, such as the drought of 1977. It has previously been found that corn varieties vary greatly in the rate of aflatoxin buildup following infection by *A. flavus*. These findings indicate that this aflatoxin problem on corn may be solved wholly or partially by breeding, both for low toxin buildup and for insect tolerance, and by use of cultural or chemical practices designed to keep insect populations at a minimum.

One of the serious diseases of camellias in the South is dieback and canker caused by the fungus *Glomerella*. This disease is especially severe on the species *Camellia sasanqua*. Several varieties of sasanquas that are resistant to this disease have been found. When these varieties become infected, a canker may be formed, but this canker soon ceases to grow and gradually heals over. This resistance is inherited through the seed since some resistant seedlings have been obtained by planting seeds from resistant varieties. Several of these seedlings show promise of providing new varieties of sasanquas that are adapted to South Carolina conditions, have attractive foliage and flowers, and are resistant to dieback.

In dry seasons, standard procedures of assaying soil nematode populations often fail to detect known high populations of ring nematodes. This particular nematode has been associated with premature death of peach trees, referred to as peach short life. If dry soil samples were moistened and stored in the refrigerator for several days or if the soil sample was placed for a short time in a blender or if high sugar concentrations were used in the extraction process, then populations of the ring nematode could be detected and measured. This provides a method for assaying ring nematode populations at any time of year, regardless of soil moisture.

*Poultry Science*

Clemson University's fowl cholera vaccine has been accepted across the United States and is credited with saving the turkey industry millions of dollars. In spite of its great success, a continuing
research effort on the vaccine is needed because of questions that users ask and because of occasional failures.

One persistent question turkey breeder flock owners have asked is whether vaccination of turkeys that were laying eggs was harmful. Two experiments were conducted to find an answer. Turkeys were observed with vaccination during the growing period only, with no vaccination at all and with many or few vaccinations while in egg production. Upon challenge with a field strain of fowl cholera, most unvaccinated turkeys died. All vaccinated turkeys were protected to some degree and those vaccinated several times were least affected by the challenge. The vaccination procedure, whether many or few times, has no bad effects on egg production, fertility or hatchability.

The Poultry Science Department has environmental chambers that can simulate a hot summer or a cold winter climate. Two trials were recently completed which involved growing chickens from two weeks of age to eight months of age under three constant temperatures: 70, 85 and 90 degrees F. It was known that hot weather will reduce growth rate, feed intake and increase water consumption. However, it was not known that 95 degrees F. would bring roosters into sexual maturity at seven weeks and five days of age, the earliest sexual maturity for chickens ever reported in a scientific publication. Under normal conditions a rooster does not produce semen until he is 17-20 weeks of age.

This research also showed that birds grown in 95 degree F. weather can live almost twice as long in a 115 degree F. chamber as birds grown out in 70 degree climate. It is hoped that this type of basic research can be applied to the commercial poultryman to prevent the high hen house mortality that occurs when ambient temperatures are above 100 degrees F.

Edisto Station

Using a strong team approach to problem-solving, researchers at Edisto work with their colleagues in agronomy, entomology, horticulture, plant pathology, agricultural engineering and animal science. Many scientists stationed at Clemson carry on special projects at the Edisto Station.

Research here is based on those crops that relate well to upper coastal plain soils and climate.

Important work with soybeans, and other field crops is taking place here. Horticultural work with sweet potatoes and melons is
prominent. Forage and beef cattle are given major emphasis, also, with particular stress on hay mechanization and storage.

**Pee Dee Station**

Tobacco research is conducted exclusively at the Pee Dee Station at Florence. Cotton, corn, and soybeans are also grown experimentally.

Extensive experimentation with the mechanization of the total production and processing systems of tobacco has taken place at Pee Dee. Since the once-over harvester's manufacture, a great deal of research effort has turned to barn storage and bulk curing of the crop.

This year a commercial variety of upland cotton adapted to production in the Southeast has been released after testing at this station and should be available for commercial plantings in 1978 or 1979.

**Sandhill Station**

Horticultural research gets major attention at the Sandhill Station, where fruits and vegetables are grown in the sandy soil of the South Carolina Sandhill region.

Pecan research in Sandhill orchards is showing promise. Irrigated orchards at the station have trees bearing nuts at three years. Peach orchards here contain a number of excellent peaches that are nearing release.

Vegetable-growing that is particularly suitable to the sandy soils of the Sandhill section of the State is emphasized. This program includes new crop evaluations and innovative cultural practices.

**Truck Station**

Investigations at the Truck Station in Charleston feature a systemized approach to commercial vegetable production in the State. Through cooperative research with the nearby U.S.D.A. Southeastern Vegetable Breeding Laboratory and with other states, researchers increase the total store of information by using all available resources.

Rice and tea investigations continue with an eye toward broadening the base of the state's agriculture. The Truck Station's urban research and demonstration area, established last year jointly with the Clemson University Cooperative Extension Service, continues to be much-visited. Maps are now available for self-guided tours through the plots of ornamentals and vegetables.
Experimental Statistics Unit

The station's Experimental Statistics Unit continues to place major emphasis on consultation with researchers in the design of research with a follow up of data analysis and interpretation. As a parallel program to the professional consultations, the unit's personnel furnish needed services in data preparation and data analysis. The combination of consulting, data analysis, and aiding in the interpretation of research has greatly increased the efficiency of research in the Agricultural Experiment Station.

Funds for the Experiment Station Other Than Those From Federal Sources
Classification of Expenditures and Receipts for 1976-77

<table>
<thead>
<tr>
<th>State Appropriation and Operating Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditures</td>
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<tr>
<td>Classified Positions</td>
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<tr>
<td>Faculty and Staff</td>
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<tr>
<td>Graduate Assistants</td>
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<td>Students and Other Temporary Help</td>
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<td>Travel</td>
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<tr>
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<tr>
<td>Postage, Supplies and Materials</td>
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<tr>
<td>Rents and Fixed Charges</td>
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<tr>
<td>Equipment</td>
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<tr>
<td>Permanent Improvements</td>
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</tbody>
</table>

| Receipts from State Treasurer (Regular Approp.) | 5,107,451 |
| Operating Revenue Receipts                   | 906,106    |
| Unexpended Balance Brought Forward from Previous Year | 137,540 |

| Balance Forward | $ 95,529 |
### Federal Funds

**South Carolina Agricultural Experiment Station 1976-77**

<table>
<thead>
<tr>
<th>Hatch</th>
<th>Regional Research Funds</th>
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<tbody>
<tr>
<td>$319,028</td>
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<td>$120,912</td>
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</tr>
</tbody>
</table>

| Expenditures | $1,542,761 |
| Receipts for the Year from the Treasurer of the United States | $372,809 |

*Hatch Expenditures*
Active Research Projects, 1976-77

Agricultural Economics and Rural Sociology

Economic appraisal of potential technological and institutional changes in South Carolina agriculture.
Systems analysis of the vegetable subsector of the food industry of the South.
An economic analysis of adjustments in rural human resources as new technology is adapted.
The economic and social effects of farm resource transfers out of the dairy industry in South Carolina.
Analysis of opportunities to develop rural tidelands industries through improved financial management.
Economic analysis of harvesting, handling, and storing hay.
An extension community resource development process: analysis and evaluation.
Feed mill costs and return in South Carolina.
Implications of alternative federal energy policies on South Carolina economy, with emphasis on agriculture.
Local factors affecting industrial plant location in rural communities of the South Carolina Coastal Plains.
Marketing performance of selected milk pricing systems for the Southern Region.
Career orientation of college students in agriculture and home economics.
The economics of peach production in South Carolina.
Public investment alternatives to meet projected manpower needs in South Carolina.
Efficiency of identification, assembly and transportation of cotton to mills and export outlets.
Alternative structures for increasing efficiency in inter- and intra-regional grain marketing systems.
Supply pricing and marketing alternatives for cattle, beef systems in the South.
Land tenure adjustments and the South Carolina economy.
Electrical peak loads and the changing tobacco curing process.
A comprehensive econometric model of the U.S. tobacco industry.
Social organization for development of low income rural counties.
Defining and achieving life goals: a process of human resource development.
Information Filter Center to aid in marketing.
Evaluation of the beef production industry in the South.
Providing basic agricultural marketing information for program
and facility planning.
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.
Analysis of demographic data for the human resources of South
Carolina.
Development of human resource potential of rural youth in the
South and their patterns of mobility.
Effects of selected changes in the real property tax system on land
use and tax revenues in South Carolina.
Economic and sociological aspects of comprehensive land-use plan-
ning in South Carolina.

Agricultural Engineering
Animal waste treatment and recycling systems.
Root zone water management systems.
Physical properties of fruits and vegetables relating to automatic
sorting.
Farm and gin community evaluations of machinery complements
for harvesting and hauling seed cotton.
Engineering systems for cotton production.
Quality housing environment for low income families.
Poultry farm waste management.
Development and evaluation of mechanized production systems for
fresh market peaches.
Simulation of processes in the rhizosphere.
Development and evaluation of oyster harvesting equipment and
mariculture systems.
Nutrient management of poultry waste with biological treatment
processes.
Decision making in crop water management.
Mechanization of tobacco harvesting and curing systems.
Utilization of cattle feedlot waste through land application.
Soil and environmental factors affecting longevity and productivity
of peach trees.
Methods and equipment for optimum herbicide placement.
Soybean production and management simulation models.
Development of hydrologic/water quality models for agriculture and forestry.
Mechanization of okra harvesting.
Storage of baled coastal bermudagrass hay.
Automatic controller to improve harvest efficiency and reduce soybean damage.
Feasibility of mechanizing the production of vegetables for fresh market and processing.
Dynamic modeling of weed control in cotton production.

Agronomy and Soils
Orchardgrass improvement.
Sulfur supply of air, rainwater, and soil as related to agronomic and horticultural crop needs.
Adaption and breeding of a cool-season forage grass species.
Plant analysis for complementing soil tests in evaluation of nutrient availability.
Weed control in permanent pastures and other forage crops in South Carolina.
Interaction of representative pesticides with dominant South Carolina soils and model soils.
Hybrid corn breeding.
Selection for heat-drought tolerance in agronomic crops and treatments to induce tolerances in white clover.
Sorghums for silage production.
Hybrids for supplementary summer pastures.
Soil-water and plant water relations in soybeans as related to root growth.
Soil biophysical factors affecting soybean root growth, nitrogen fixation and yields.
Cytogenetic studies of white clover and related species.
Tobacco production.
Tobacco breeding and genetics.
Diagnosis and correction of boron and manganese problems in crop production.
Development of weed control practices in corn, cotton and soybeans.
Production, propagation, evaluation of inter-specific forage legumes through cell and callus culture.
Minimum tillage and double cropping on weed populations and persistence and fate of herbicides.
Diagnosis and correction of manganese and molybdenum problems in legumes.

Enhancing biological dinitrogen fixation in soybeans and other legumes.

Chemical, physical, and mineralogical properties of selected soils of South Carolina.

Cotton breeding.
Small grain breeding.
Soybean breeding.
Evaluation of selected varieties and advanced experimental strains of cotton.
Evaluation of corn hybrids and advanced breeding lines.
Evaluation of selected varieties and advanced experimental strains of soybeans.
Evaluation of varieties and experimental strains of wheat, oats, barley and rye.

South Carolina soybean yields as influenced by row spacing.

Soil behavior under different levels of management and use.

Evaluation of selected grain sorghum hybrids.

Animal Science
Genotypic and phenotypic response of crossbred cattle under different levels of management.
Factors influencing nitrogen utilization in the equine.
Comparison of methods of measuring composition in the live animal.

Roasted corn in diets for growing-finishing pigs.
Productivity of gilts fed two levels of calcium and phosphorus in confinement.

Fat addition to growing-finishing swine relations.
Forage systems for backgrounding and finishing cattle.
Caloric density of diets for 3-week old pigs.
Regulation of reproduction in beef and dairy cattle with exogenous hormones.
Monensin and corrugated paper boxes in growing and finishing rations for steers.
Factors responsible for tenderness variations in meat.

73
**Dairy Science**

Innovative materials handling for packaging and distributing milk.
Ensiled complete rations for lactating cattle.
Waste disposal management in the dairy industry and its relation to surface water quality.
Feeding value of fermented colostrum for preruminant calves.
The role of energy compounds and hormones in regulating lipid metabolism in ruminants.
Effect of age and quality of raw milk on the shelf-life of the processed fluid product.
Aflatoxin B₁ consumption and stability of related metabolites in milk and tissue.
In vitro development of porcine embryos.
Role of the uterus in embryonic survival and mortality.
Improving reproductive efficiency in South Carolina dairy herds.

**Entomology and Economic Zoology**

Alfalfa insect pest management.
Insect pest management.
Effect of infection by *Eimeria spp.* upon intestinal absorption of carbohydrates in chicks.
Development of pathogens for use in a pest management system for soybean insects.
Investigations of leucocytozoonosis in poultry in South Carolina.
Bionomics and control of insects on cotton.
Southern pine beetle management.
Distribution and biology of parasites in domestic animals.
Insects as hosts and vectors of viruses.
Biology, ecology and management of peach insects.
Ectoparasites of poultry and synanthropic flies associated with poultry and livestock, their biology and control.
Culture of warm water fishes.
Studies of the economically important species: *Mercenaria mercenaria* and *Macrobrachium rosenbergii*.
Pathological relationships between insects and biological control agents.
An integrated system for the suppression of the boll weevil.
Control tactics and management systems for arthropod pests of soybeans.
Tobacco insect investigations.
Insects on corn and miscellaneous field crops.
Biology and control of insects attacking ornamental and greenhouse plants.

Analysis of predation of *Mercenaria mercenaria* by decapod crustaceans.

Ecology and management of wood ducks (*Aix sponsa*) in South Carolina.

Anatomy of the larvae of the velvetbean caterpillar, *anticarsia gemmatalis*.

Freshwater food animals.

Development of alternative control methods to mirex and chlordane for the imported fire ant.

Some important aspects of reproduction in feral swine populations in South Carolina.

Bionomics of insects of forest trees and wood products in South Carolina.

Biology and control of insects affecting man and animals.

Control of arthropods on apples.

Control of vegetable insects in the Piedmont of South Carolina.

Biology and control of arthropods attacking pecans.

Identification and distribution of insects of economic importance in South Carolina.

*Food Science*

Growth of and toxin production of *Clostridium perfringens* in food.

Oral contraceptives and nutritional status.

Composition, nutritive value and stability of poultry meat and egg products.

Quality of dried sausages.

Microbial injury and food quality.

Factors influencing nutrient absorption.

Relation of nutrition to porcine stress syndrome.

Zinc and cadmium status of children and adolescents in South Carolina.

Nutritional impact of fat-altered diets.

Regulation of pituitary function during post-partum-anestrus in young beef cows.

Postharvest physiology of fruits.

Quality maintenance measurement and control in the marketing of vegetables.

Utilization of oilseed materials as human food.

Effect of light on postharvest fruit.
Behavior of offspring as influenced by nutritional aberration and ethanol.

*Home Economics*

Patterns of food intake and nutritional health of girls.
Needs of child care and potential for rural family and community development.
A model system to determine the role of molecular sizes of carbohydrates on mouth sensations.
Effects of laundering temperature and agitation speed on fire resistant finishes.
Activities of the South Carolina day care centers for the aged.
Laboratory and consumer evaluation of comfort in fabrics from cotton and/or other fibers.
Defining and achieving life goals: a process of human resource development.
Influences on occupational goals of young people.

*Horticulture*

Cultural management of centipede grass.
Cultural and management practices for peaches and small fruits.
Therapeutic, physical, psychological and rehabilitated responses to certain aspects of horticulture.
Use of chemical preservatives in extending the vase life of cut snapdragons.
Detection and evaluation of plant growth-environment relationships.
Physiological study of plant growth regulators on woody ornamental plants.
Breeding edible Southern peas.
Growth regulators in peach production.
Mineral nutrition of peaches and grapes.
New or special crops.
Cultural and management practices for pecans.
Development and evaluation of rootstocks for peach.
Breeding bunch grapes for the Southeast.
Influence of environmental factors and chemical growth regulators on growth and development of floricultural crops.
Evaluation of woody ornamental plant material with respect to variety, production, propagation and marketing techniques.
Cultural studies and functional uses of woody ornamental landscape plants.
Uses of seaweed and other organic materials in economically important horticultural crops.
Quality maintenance of mechanically harvested horticultural crops for fresh market.
Delayed ripening and senescence in peaches and other fruits.
Establishment and maintenance of scionwood and seed increase blocks for peach tree certification.
Vegetable culture.
Breeding watermelons and evaluation of watermelon and cantaloupe varieties.
Improvement of turfgrass nutrition and associated management practices.
Tea, *Camellia sinensis*, culture, ecology, propagation and pest control.
Coastal lawn grasses, fruits and ornamentals.
Evaluation, improvement, horticultural crops and varieties.
Nutrition, management, horticultural crops and varieties.
Growth regulators and orchard designs for production of peaches.
Evaluation of fruit varieties and rootstocks.
Vegetable variety testing and improvement.
Processing fruits and vegetables.
Evaluation and improvement of flowering plants with relation to variety and productive techniques.
Development of weed control practices for vegetable crops.
Development, production, management of turfgrass.
Peach breeding.
Apple production.
Evaluation of vegetable varieties and cultural practices.

*Plant Pathology and Physiology*
Integrated plant disease control and farming systems with field and vegetable crops.
Etiology, epidemiology and control of pecan diseases.
Bacterial canker and other factors associated with peach tree short life.
*Hoplolaimus columbus* (lance nematode): population management, crop damage and control.
Peach tree short life: a physiological approach.
Ecology and control of fusiform rust on Southern pines.
Disease control on vegetables.
Nature and extent of variation in rootknot and cyst nematodes.

77
Epidemiology of the *Aspergillus flavusoryzal* group of fungi and control of aflatoxin in corn.

Cause and control of diseases of shade and ornamental trees.

Reduction of aflatoxin development in corn by cultural practices and breeding.

Tobacco disease control in South Carolina.

Rhizosphere ecology as related to plant health and vigor.

Causes and control of diseases of ornamental crops.

Physiological and biochemical mechanism of herbicidal action.

Development of integrated fruit disease control programs in South Carolina.

White clover pathology, virus and other diseases.

Viruses and mycoplasma-like organisms causing diseases of corn and sorghum.

**Poultry Science**

Artificial insemination and fertility studies with caged breeder chicks.

Recycling of turkey litter into ruminant diets.

Reproduction characteristics and nutritional requirements of minor poultry groups.

Marketing potential of white leghorn cockerels and other minor poultry groups.

Rabbit Coccidiosis and nutrition.

*In Vitro* cultivation of the chick embryo.

Improvement of egg shell quality through nutrition and management.

Improving production efficiency of meat type poultry.

Environmental effects on chickens.

Immune response of chickens and turkeys vaccinated against fowl cholera disease.

Leucocytozoon disease of turkeys: hematology, immunology and control.

Composition, nutritive value and stability of poultry meat and egg products.

Turkey reproduction-physiological, nutritional and environmental interactions.
Experiment Station Publications, 1976-77

Bulletins


SB 595—Agricultural Growing Degree Days in South Carolina. Alex J. Kish, Wayne L. Ogle and Joe E. Toler.

SB 596—Inspection and Analysis of Commercial Fertilizers in South Carolina. H. V. Rogers.


Circulars

SC 173—Field Drying, Storage and Feeding of Coastal Bermuda-grass. William A. Balk.


Research Series

Agricultural Economics and Rural Sociology

393—South Carolina Cash Receipts from Farm Marketings. R. M. Foster.


Agricultural Engineering
22—Simulation of the Peach Tree System During Swelling to Predict Optimum Harvest Date. T. R. Garrett, B. K. Webb and J. R. Lambert.

Agronomy and Soils

Animal Science

Dairy Science

Horticulture
173—Pre-Emergence Herbicides for Annual Weed Control in Groundcovers—1975. A. J. Lewis III and J. S. Lewis.
176—Ethoprop (Mocap) Rate, Formulation, and Time of Application Study with Sweet Potatoes. Max G. Hamilton.
Technical Bulletins

TB 1058—Technical and Economic Evaluations of Turkey Litter Silage as a Feed Source for Replacement Dairy Heifers. C. Stassen Thompson, W. Thomas Borders, Dee L. Cross and Bruce F. Jenny.


Technical Contributions

July 1, 1976 - June 30, 1977

1384—Immune Response of Turkeys Vaccinated with Live *Pasteurella Multocida* in the Drinking Water While on Use Level of Rofenaid in the Feed. William T. Derieux.


1386—Effect of Soil Fumigation and Pruning Date on the Indole Acetic Acid Content of Peach Trees in a Short Life Site. George E. Carter Jr.


1390—Growth and Mineral Content of Cultured Chick Embryos. B. E. Dunn and M. A. Boone.
1391—Increased Numbers of Heat Resistant Spores Produced by Two Strains of Clostridium perfringens Bearing Temperature Phage s9. Adelle W. Stewart and M. G. Johnson.


1398—Avian Species Diversity in Relation to Beaver Pond Habitats in the Piedmont Region of South Carolina. Kerry P. Reese and Jay D. Hair.


1400—Microbial and Acidity Changes in Colostrum Fermented by Natural Flora at Low and High Ambient Temperatures. B. F. Jenny, M. G. Johnson and G. D. O'Dell.


82
1405—The Ontogeny of Food Preference Behavior in Bobwhite Quail. Ronald J. Kendall, D. Lamar Robinette and Raymond Noblet.


1410—Direct Evidence for Pulsatile Release of FSH and LH in Juvenile Female Rats. L. S. Frawley and D. M. Henricks.

1411—The Effects of Active Immunization Against Oestradiol-17β in the Cyclic Ewe. N. C. Rawlings, S. W. Kennedy and D. M. Henricks.


1422—Dilution Rates of Sour Colostrum for Dairy Calves. B. F. Jenny, S. E. Mills and G. D. O'Dell.
1423—Flue-Cured Tobacco Yield Losses From Tobacco Budworms. Albert W. Johnson.
1426—Choanephora cucurbitarum as a Pathogen on Okra Pods. Robert Duer and W. M. Epps.
1428—Effect of Methionine Analog on Nitrogen and Mineral Retention and Digestibility of Urea Fortified Ration by Young Ruminants. Glen O'Dell and B. F. Jenny.
1432—Use of GASP IV to Model Agricultural Systems. Gaines E. Miles.
1433—Field Test Procedures for Fungicides Used to Control Apple Diseases in South Carolina. Eldon I. Zehr.
1435—Dynamics of Water in Maize Plants: Sensitivity Analysis of TROIKA. Donald C. Reicosky and Jerry R. Lambert.

1439—Threatened Species Diversity of Fresh Water Insects in South Carolina. John C. Morse.


1446—Imprinting as Related to Food Preference Behavior in Adult Bobwhite Quail. Ronald J. Kendall, Raymond Noblet and D. Lamar Robinette.


1449—Effectiveness of Certain Fungicides for the Control of Pecan Diseases. R. W. Miller, C. E. Drye, William Goff and Robert Duer.


1459—Effects of Poultry Waste Effluent and Insecticides on Corn Production. R. O. Hegg and H. D. Skipper.


1461—Survey of Pine Pitch Canker in South Carolina. Helmuth Kraus Sch. and Wesley Witcher.


1466—Preliminary Field Observations on the Use of Sour Colostrum as a Calf Feed. Bruce F. Jenny and R. Eugene Wright.

1467—Total, Lactic, Coliform, Escherichia Coli and Staphylococcus Aureus Counts on Surfaces of Carcasses and in Ground Beef from Carcasses Treated or Not Treated with HOCl Spray. M. G. Johnson, T. C. Titus, Linda H. McCaskill and J. C. Acton.
1468—Microbial Persistence on Inoculated Beef Plates Sprayed with Aqueous Hypochlorous Acid. T. C. Titus, J. C. Acton, Linda McCaskill and M. G. Johnson.


1472—Lack of Effect of Tetrachlorvinphos as a Feed Additive in Control of Gastrointestinal Nematodes of Beef Cattle. Gayle Pittman Noblet.

1473—A Survey of Edible Crawfish from the Coastal Plain of South Carolina. Maureen W. Bagwell and Harold A. Loyacano Jr.


1483—Validation of a Physiological Day Equation: Development of the Mexican Bean Beetle on Snap Beans and Soybeans. J. L. Bernhardt and M. Shepard.


1485—The Juvenile Female Rat as a Physiologic Castrate. L. Stephen Frawley and Donald M. Henricks.


1489—Efficiency of Producing Hatching Eggs via Artificial Insemination and Natural Mating of Broiler Breeder Pullets. B. L. Hughes.


1491—Physiological Reactions of Chickens to a Lifetime of Constant Temperature Stress. K. V. Vo, M. A. Boone and W. E. Johnston.


1493—Gonadotropin Synthesis and Release in the Juvenile Female Rat. L. Stephen Frawley and Donald M. Henricks.

1494—Improvement of Techniques for Determining Populations of *Criconemoides xenoplax* in Dry Soil. Ernest G. Lawrence and Eldon I. Zehr.


1496—Shell Gland Oxygen in Hens Producing Eggs of Low or High Specific Gravity. D. M. Huntley and D. P. Holder.
The Cooperative Extension Service is Clemson University's outreach educational program for the citizens of South Carolina. In the six decades since the Cooperative Extension Service came into existence, farm families have played a vital role in shaping a dynamic and changing agriculture to fulfill their needs and solve their problems. The Extension Service has worked hand-in-hand with South Carolina's farm families to help them shape a better life.

Funded by federal, state and county governments, the Extension Service was established in 1914 as part of a nationwide system designed to carry education from land-grant universities to the people. Extension is built around the concern and dedication of local citizens and community leaders who help guide extension programs. In every community of every South Carolina county, citizens serve as volunteer leaders and members of program planning committees and advisory boards.

Clemson maintains an office in each county seat of South Carolina, staffed by county agent personnel and extension home economists. At the University a professional staff of extension subject matter specialists compiles information from research results and translates this into usable data for the people of South Carolina. This insures a constant flow of information to producers, homemakers and youth in all counties of the State.

Extension was originally conceived to help rural people, but with changing social structures, advances in transportation and communication and changes in economics, Extension has broadened its scope of activities to include many urban and suburban problems. Extension responds to the needs of the people it serves.

Extension's efforts are organized into six broad categories including agricultural programs, 4-H and youth development, home economics, community and resource development, special programs and 1890 programs.

In agriculture, extension specialists and county staffs work with producers, those with large operations and small, keeping them abreast of new developments in production practices, marketing and management.

Extension home economists update homemakers, rural and urban, on new developments in food, clothing, home management and a number of other specialized areas.
Extension’s unique 4-H program challenges young people to learn by doing and offers them opportunities in many fields—agricultural, home economics, leadership and many others—to make them more aware of their potential as productive citizens.

Extension staff members are teachers. They carry Clemson University’s outreach educational program to all areas of South Carolina and are at home in any classroom—to tobacco field, dairy barn, assembly hall, homemaker’s kitchen or 4-H camp. Extension is developing and carrying educational programs to the people—programs which help them increase incomes and maintain desirable levels of living in their communities.

**Agricultural Programs**

**Scope of Activity**

Income from agriculture continues to be a major contributor to South Carolina’s economy. More than $900 million from crops and livestock went into the state’s economy during 1976-77. Numerous programs encompassing 12 departments in production agriculture were carried out by the Extension Service during the year. Highlights of some of the work follow.

**Agronomy**

Improving cotton yields and increasing production are major goals of agronomic extension programs. State, regional and local meetings are conducted to inform growers of latest production practices. Publications, newsletters, field demonstrations and mass media presentations also are used to emphasize the importance of timely and accurate implementation of production practices. Major emphasis has been on weed control, fertilization and defoliation.

Forage education programs continue to emphasize growing legumes to reduce nitrogen fertilizer requirements and improve forage quality. As a result, some growers are topseeding arrowleaf clover in grass pastures to obtain grazing during critical months along the coastal plain. Piedmont cattlemen have improved many acres of fescue pastures and reduced fuel costs by chemically or mechanically scarifying the sod and seeding Tillman white clover.

The agronomy forage specialist assisted with preparing statements assessing weather losses of forage and preparation of emergency feed alternatives in two disaster situations.

Alfalfa demonstrations initiated three years ago have stimulated renewed interest in this crop for dairy and beef cattle production. Alfalfa is excellent for hay and is also a high value crop.
Field demonstrations were used to show the optimum level of nitrogen and factors to consider in nitrogen management for corn production.

During the year three soybean meetings were held to bring growers up-to-date on latest production practices. Approximately 300 growers attended these meetings, held in the three major soybean production areas.

Fifteen on-farm demonstrations were conducted to show best available varieties, pest control practices and tillage practices. Tours of demonstrations were held during growing seasons. Some 400 growers participated in the soybean demonstrations.

Animal Science

Swine Program: Extension animal scientists held three district swine meetings during December and January. These meetings, designed to meet the special needs of the modern commercial hog grower, attracted more than 200 producers.

District in-service beef and swine meetings, held during the early spring, brought extension agents up-to-date in latest animal production practices and techniques of management.

Swine evaluation by production testing methods continues to increase and improve performance for South Carolina herds. The Evaluation Center at the Sandhill Experiment Station has seen a continuous increase in daily gains and feed conversion. Purebred producers are not only testing but are purchasing more tested herd sires for their own use. Results, when applied, have been effective in improvement.

A swine on-the-farm test program has been initiated with five herds presently on test. Records are being processed by computer terminal operation from the Sandhill Station. Turn-around time is fast and the information is available for the producers’ use within one week.

Beef Program: In late winter and early spring of 1976, animal science extension—in cooperation with county extension workers, area livestock agents and beef producers—initiated demonstrations with the growth-promotant Zeranol (RALGRO®) in suckling calves. These demonstrations were conducted in 29 herds in 18 counties and involved 961 calves. The treated (implanted) heifers gained 16.5 pounds more than their unimplanted counterparts in 118 days, or 9.2 per cent faster; the implanted steers gained 13.3 pounds more than their unimplanted counterparts in 113 days, or 7.4 per cent faster. This amounted to increased gains of .117 pound
per day for steers and .14 pound for heifers. As a result of these demonstrations, many beef producers implanted all their commercial suckling calves this year. This is expected to be a routine practice with non-breeding commercial calves.

The South Carolina Beef Cow-Calf Handbook, planned and prepared by specialists in the Southern region, was made available to the public in the spring of 1977. It includes 40 fact sheets with an updating service to extend at least five years and will eventually contain about 80 fact sheets.

The performance testing program continues to grow. Last year 131 producers from 33 counties entered the program with 4,711 calves weighed and graded.

Agricultural Engineering

A Peanut Production and Harvesting Field Day was conducted at the Sumter Agricultural Development Project and provided peanut growers the latest production information available. More than 150 people attended.

Fertilizer spreader clinics, held in three locations in the State, illustrated the problems associated with improper distribution of fertilizer from bulk spreaders and methods by which the distribution could be improved.

A series of irrigation meetings and demonstrations conducted throughout the State point out the growing interest in irrigating South Carolina farm land. An irrigation demonstration at the Sumter Agricultural Development Project is a continuing effort. A series of tours to an adjoining state enlightened farmers on methods and benefits of irrigation.

Much attention has been given to energy conservation problems at all levels of public service organizations and industry. The Clemson Cooperative Extension Service has a long history of involvement in educational and action programs to reduce energy needs for household heating. In the immediate past much attention has been devoted to promoting and developing a capability for using solar energy in household heating. A house plan with a warm air solar heating system has been developed by the Rural Housing Research Unit located at Clemson. This plan is being introduced and distributed nationwide.

The energy crisis of 1973 seems to be developing into as significant a benchmark for housing as Sputnik was for science. Since 1973 the pattern of housing concerns has centered on reconditioning for energy efficiency. Escalating construction costs have directed con-
siderable attention to remodeling existing homes to meet new needs and designing new homes for energy efficiency. Thus, the major activity of the year has been energy conservation in housing through new design, new construction procedures, reconditioning existing homes and managing for effective energy conservation.

**Dairy Science**

The three most important highlights in dairy science the past year include:

Urban 4-H Dairy Science Program—In May 1977, dairy extension personnel presented a series of talks to city school youngsters in three schools. These children in grades four through seven were given information on how milk is produced in South Carolina; how milk is made and produced by the cow; how milk is processed and pre-tested; nutrients milk contributes to human diet; and the importance of the dairy industry to South Carolina. More than 700 students were involved in the 23 sessions.

Dairy Labor Training—The size of dairy farms and the technology needed to operate them is increasing, making better trained dairy farm labor imperative. A cooperative effort between Orangeburg-Calhoun Technical Education Center and dairy extension personnel resulted in a dairy labor training school taught at Orangeburg-Calhoun TEC during the fall and winter months. Some 19 people from dairy farms in Orangeburg, Calhoun and Bamberg Counties attended. This school was so successful dairymen of the area have asked that it be repeated and an additional school be started for dairy herdsmen. These schools will run 8 to 10 weeks with two, 2-hour sessions each week.

Artificial Insemination Refresher Training Sessions—A majority of the dairy cattle in the State are bred artificially each year, but in making the change from natural service to artificial breeding, some efficiency has been lost. It is optimum for dairy animals to have a calf each year, but the average for the past few years has been a calf every 14 months.

In an effort to overcome this problem a series of three, 2-hour sessions were offered to dairymen through County Extension offices. Discussed was semen handling, breeding technique and management practices related to reproductive efficiency.

**Entomology-Economic Zoology**

Cotton pest management continues to grow in popularity with well over 50 per cent of the state's acreage in scouting programs.
Growers recognize that pest management saves money while maintaining good yields. During 1977 extension entomologists helped carry out an emergency program for the use of several new cotton insecticides to control outbreaks of cotton bollworms.

Extension entomologists hope to develop a successful pest management program for alfalfa, using primarily biological control with parasites of the alfalfa weevil. If this program is successful, alfalfa could make a comeback as a forage crop for South Carolina.

Department entomologists have played an important role in pecan orchard rejuvenation and expansion in the past year. Improved insect control practices and new insecticides are important aspects of this program. With peaches, new pest control management techniques were developed which have helped growers obtain better control and reduce costly insecticide applications.

Tobacco, South Carolina's leading money crop, received renewed emphasis with the assignment of an extension entomologist at the Pee Dee Station. In addition to regular insect control programs and grower assistance, this specialist continued the 1976 tobacco residue program which has already pinpointed the few problem areas that existed. This year's program should reveal progress in reducing residue levels in tobacco.

Extension entomology actively supports urban people with their pest problems in the home and on valuable ornamental plants. Plant clinics held throughout the State were well attended and hundreds of insect problems handled. Many homeowners received assistance with the structural insect problems such as powder post beetles, wood borers, and termites.

Pesticide certification has been an outstanding success. During 1976 more than 1,000 commercial and 6,000 private applicators were trained. Nine training schools were held for commercial applicators and dealers and more than 110 county sessions were supported. This program will continue as long as necessary to meet the requirements of state and federal laws on application of pesticides.

Extension wildlife programs continue to grow as wildlife specialists are called upon for consultation in game management, pest animal control, aquatic weed control, farm pond management and fish bait propagations. Highlights of wildlife extension activity include the beaver management program and farm pond management. Beavers have become a real problem in recent years to landowners. Cooperative clinics with the South Carolina Wildlife and Marine Resources Department were held for landowners and other
interested parties. Farm pond management clinics trained farmers and county extension staffs during 1976.

**Food Science**

Food science extension efforts emphasized improving the efficiency of commercial food processing systems and reducing waste discharges.

Specialists conducted 33 days of successful demonstrations at selected food processing plants. These efforts included reorganizing a processor's tomato line which resulted in a 50 per cent reduction in labor costs. Additional benefits were realized with improved product acceptability and a reduction by one half of the volume of waste water discharged. Other improvements include increasing the shelf life of finished cuts and ground beef by four days by spraying beef carcasses with chlorinated water and identifying potential sources of spoilage organisms in soft drink and peach operations. Outlining the economical infeasibility of preparing dried meal from the wastes of small catfish dressing plants prevented an unnecessary capital expenditure.

Some 35 on-site technical assistance visits to the state's 22 community canneries resulted in recommendations for updating equipment installations and improving operating procedures for preserving home grown produce. These suggestions should eliminate food spoilage problems experienced by several canneries in the past and should improve product quality. Improvements may eventually mean more gardeners will take advantage of the facilities.

**Forestry**

Forestry extension has been involved in a cooperative effort with Agricultural Economics to develop an acceptable procedure for assessing agricultural real property for tax purposes. When fully developed, this procedure will enable the South Carolina Tax Commission to implement the agricultural fair market value provisions of the new tax law.

Data compilation and publication has been a principal forestry extension activity. Valid data forms have been developed in cooperation with state and federal agencies, forest industries and private firms. The new forms of data are now being accepted and published in publications such as the “cash receipts” bulletins of the South Carolina Crop and Livestock Reporting Service. Another “first” was the release of a county forestry fact sheet for each county. Plans are to continue to update the data base and publish current county
forestry fact sheets periodically. Techniques for achieving this ob-
tive are in the planning stage.

Training sessions were held at various locations throughout the
State for forest landowners, practitioners and the general public.
Examples include a pesticide certification workshop for practitioners
in Columbia, a marketing program for landowners in Lancaster, a
prescribed burning meeting for landowners and practitioners in
Manning, a log and lumber grading workshop at Clemson, and a
reforestation meeting for landowners in Lexington. A new audience
for workshops was established when the Soil Conservation Service
requested sessions for their field personnel. Training sessions for
this audience will be held periodically on a variety of subjects.

Horticulture

Extension horticulture assists commercial growers, processors,
home producers and suppliers of fruit, vegetables, ornamental
plants and turf. The unit strives to accomplish its goals primarily
through group workshops and field days, although considerable
consultation also is required.

Workshops were held in all subject areas. Short courses for nur-
serymen, greenhouse operators and grounds maintenance personnel
reached more than 450 producer-businesses. Field days for peach
and pecan growers were well attended. The joint Georgia-South
Carolina Apple Meeting, held in Greenville, was quite successful.
Vegetable and ornamental classes were held on a county basis both
by county staff and specialists. A total of six conferences were con-
ducted for commercial turf managers and producers. Plant prob-
lem clinics at Columbia, Spartanburg and Conway assisted more
than 15,000 residents with diagnosis and cure of home-related plant
problems. Extension horticulture participated with the South Caro-
lina Agricultural Experiment Station to conduct a full day vegetable
garden and turf demonstration and workshop at Clemson attended
by more than 700.

Extension horticulture conducted demonstrations on soil mixes,
fertilizers, herbicides and soil amendments for nurserymen. A pecan
rejuvenation demonstration was held at Horrell Hill near Colum-
bia. It is a continuing demonstration site used by several depart-
ments. Another interdisciplinary demonstration was designed to aid
growers in the control of pole bean root rots. Turf demonstrations
included overseeding and herbicides at six locations.

A pilot pest management project to improve management of
peach tree short life has been expanded from Edgefield County to
include Aiken, Saluda, and Lexington counties. The project now includes 55 commercial growers and approximately 12,000 acres of peaches. Grower awareness and application of short life management practices have sharply improved as a result of this project.

A program initiated for certification of peach nursery stock will supply commercial nurserymen peach budwood and seeds which are true-to-name and free of virus diseases. This program should become self-supporting through sale of budwood and seeds. Surveys show strong grower support for the program.

**Plant Pathology**

Efforts over the past five years to assist peanut growers have resulted in grower organization of a State Peanut Board and an annual statewide peanut meeting. Many new pesticides for peanut disease control were evaluated and demonstrated as show-and-tell projects. Average peanut yields are increasing.

Efforts to help peach growers control the serious bacterial spot disease has resulted in the Environmental Protection Agency's clearance of the bactericide Terramycin. Extension pathology led in this effort. The pest management project for peaches and the 10-point program for controlling peach tree short life have been successful. The peach disease control program was amended to take care of a benomyl tolerant strain of the brown rot fungus.

Test demonstrations have shown growers the need for approved application techniques for granular nematicides for field and vegetable crops. This is an important cost cutting program involving more efficient use of these pesticides.

**Poultry Science**

From a commercial standpoint, poultry represents approximately $125,000,000 per year income for South Carolina. Added to the several hundred South Carolinians involved in the commercial industry are thousands of hobbyists, backyard producers, interested consumers and youth.

Extension poultry provides programs to all these interests informing them of new technology and basic facts concerning the various species of animals. Meetings, demonstrations, in-service training, mass media and personal contacts accomplish the task.

Forty years ago most poultry were grown in flocks of 300 or less. Today most commercial egg and broiler producers have more than 30,000 birds on their farms with the average egg producer providing eggs for more than 22,000 people. The average broiler producer
provides broiler meat for about 16,000 people. Vast improvements in breeding, nutrition, housing and disease control have been necessary to produce these quantities. Management techniques have become more sophisticated. Extension specialists work with a limited number of integrated companies rather than hundreds of individual producers.

A statewide committee on poultry fly control has been formed and includes members from poultry science extension, entomology extension, agricultural engineering extension, S. C. Department of Health and Environmental Control and the poultry industry. The committee has established goals, held fly control meetings and developed literature which has been placed into the hands of state poultry producers.

Poultry science and animal science specialists have cooperated in studying and demonstrating the feasibility of ensiling poultry waste and feeding it to livestock. Several feeders are involved in the program and report excellent results.

At the request of county personnel, the 4-H embryology project was presented as a demonstration to the students of three Charleston County schools. Several hundred youth not normally affiliated with active 4-H programs were reached through these demonstrations. To date some 2,000 youth have been involved in this program. Three additional counties have requested in-school embryology programs for next year, with a return program for five Charleston schools.

Production-Marketing Economics

Providing a flow of updated information to farmers, extension agents, agri-business interest and the public about the agricultural situation and outlook is a basic function of extension’s production-marketing unit.

Specialists made outlook presentations for producers, credit agencies and agricultural organizations. Two special outlook editions of *Palmetto Economics* were published and press releases and other media presentations prepared for extensive dissemination of outlook material.

More than 30 issues were released of three new publications: *Extension Report, Management Marketing Memo* and *Outlook Update*. These concise reports, containing management and marketing tips as well as interpretations of economic trends are distributed to county extension personnel to help them pass along current information to clientele.
Three county management-marketing workshops emphasized decision-making in production. Marketing alternatives were presented to help producers integrate the overall production-marketing decision process. Six county marketing-management workshops emphasized marketing decisions and included refresher training in production decisions.

More than 100 key agricultural lenders participated in workshops emphasizing the lender's role in producer marketing decisions. Other programs conducted at the county level focused on production and marketing factors for farm interests.

A team approach is often the most effective educational tool. The group had a major multidisciplinary role in state, district, and county meetings for cotton, corn, soybean and livestock producers. Five area tobacco meetings held in conjunction with other agencies explained changes in tobacco grading standards and emphasized quality practices. Programs with animal science, agronomy, and agricultural engineering faculty were presented to several livestock and crop production groups. The team approach has been particularly effective for special needs.

**Tax Management:** Tax management and tax preparation are two important educational activities. Income and estate taxes are particularly important to South Carolinians. The agricultural economics extension group organized and helped present several tax schools. About 600 tax preparers enrolled in the Farm and Small Business Income Tax School offered at four locations. Staff members wrote several articles, leaflets and news releases dealing with taxes.

**Family Money Management:** Better family money management has been crucial during recent periods of inflation and unemployment. Computerized family budgeting assistance has been offered to South Carolina families to help them meet economic pressures. Much of the computer work was conducted at shopping malls to take advantage of heavy consumer traffic. An estimated 2,000 families used this educational service, made possible through a grant from the Federal Extension Service.

Fifteen other states have begun to use the computer programs developed at Clemson; others are interested in the Clemson work. Clemson workers have been asked to conduct a workshop for states in the Western Extension Region to help those states use our materials and computer programs.

**Marketing Information:** The Marketing Information Center, a division of Production-Marketing Economics, provides marketing in-
formation to the fruit and vegetable industry through reports issued prior to and during harvest. Also, there is currently much interest in direct marketing of farm products. Through a variety of means, educational material is made available to cities, counties and individuals who want to market farm products directly. Furthermore the staff coordinates and distributes a weekly fact sheet on timely marketing information for all crops and livestock. The demand for this *Marketing Highlights* report doubled during the past year.

**Enterprise Budgets:** The computerized budgeting system is a major asset of extension Production-Marketing Economics. All field crop and vegetable budgets for the past year were published from this system. With rapidly changing input prices for agriculture, Clemson's budgets have been updated for producers to use in planning. Biannual beef cattle reports containing outlook and budget information were also prepared.

**Reaching Extension Clientele:** Many potential extension clients live in urban areas and shop at shopping malls. A new project, initiated to place a “mini” extension office in the Dutch Square shopping mall in Columbia, is an effort to find better ways of reaching more people with effective educational programs. The target opening date is October 1, 1977. The experimental extension office, with emphasis on taking programs to where people can shop for both goods and ideas, will be the first in the United States placed in a high traffic shopping mall.

**Financial Management:** Financial management became an important and distinct component of the educational program during the past year. Relationships with credit agencies throughout the State were strengthened; workshops on loan decisions and lender-related marketing strategies were presented to Farmers Home Administration and Farm Credit System personnel. A major effort involved encouragement of agricultural lending by banks, a sorely needed activity in South Carolina. Workshop activity for major bank personnel, along with their branch and correspondent representatives, was begun. Bank officials have responded by making policy changes and becoming more involved in agriculture-related organizations and activities. As an indication of this interest, non real estate farm lending has increased 19 per cent in the past year while farm real estate outstanding increased by 14 per cent.

Capital and credit management training for individual producers was expanded through the use of county financial management workshops, one of which was presented in each of the state’s exten-
sion districts. Personal counseling, offered in response to requests by individuals and credit institutions, increased. Frequently this counseling involves a computerized interdisciplinary approach. Efforts also began on personal financial management for low income and non-farm rural residents.

Management Training for Small Business: Management training programs for small business firms and cooperatives were conducted in five counties under a special project funded by The Rockefeller Foundation. The program reached almost 200 managers and employees of these organizations—mostly minority group people with limited access to modern technology and markets. The instructional procedures emphasized basic management and bookkeeping subjects in a 20-hour program with weekly classes in local areas. Charleston, Sumter, Chester and Walterboro were the sites covered this year.

The same program arranged special subject seminars of four to six hours duration to address specific managerial problems of minority-owned and operated cooperatives. Six of these seminars were held during the year, involving about 100 participants in Charleston, Beaufort, and Orangeburg counties. The program has been instrumental in enabling us to reach a difficult group of disadvantaged people who are not usually served by the regular extension program.

Grain Grading and Handling: Grain quality determination is a major concern to many grain dealers. One school, held as a statewide seminar, attracted 110 participants. Another of special interest was held for 22 participants in Charleston and 18 private sessions on special problems were presented in response to individual requests.

Extension Home Economics

Extension home economics extends home economics resources of a land-grant university to citizens throughout South Carolina. Educational programs are developed and implemented to help families and individuals acquire and use knowledge and skills necessary for improving their quality of life. Programs are designed to meet the expressed needs of the state’s citizens.

Major efforts are designed to give leadership to statewide extension home economics activities and to support the 46 county extension home economics programs.

Following are some of the highlights of some of the extension home economics programs during 1976-77.
Extension Home Economics Program Planning, 
Objectives and Evaluation

Long-range state objectives were formulated in order for extension home economics programs to meet the needs of the people in South Carolina. When the objectives committee, composed of representatives from state, district and county staffs, began their work, it was evident that participation was needed from every extension home economics professional. All extension professionals were trained in Management By Objectives. The committee utilized information from county personnel to establish the following long-range objectives:

- 334,651 South Carolina families/individuals will apply management processes in the utilization of resources and the development of skills to achieve personal, family, social, economic and environmental goals by September 30, 1982, at a cost not to exceed 39,063 mandays.
- 103,595 South Carolina families/individuals will exhibit practices which lead to physical, emotional and social well-being by September 30, 1982, at a cost not to exceed 134,093 mandays.
- 48,310 South Carolina families/individuals will understand concepts and practice skills in human development, child care and interpersonal relationships by September 30, 1982, at a cost not to exceed 3,659 mandays.
- Volunteer leadership in South Carolina Extension Home Economics adult programs will increase 100 per cent by September 30, 1982, at a cost not to exceed 3,511 mandays.

For the next five years, all county and state plans of work will be based on these four objectives.

Child Development and Family Relations

This area is widening its scope to serve more families and community programs. While maintaining programs for traditional groups, it is reaching a broader audience than in past years.

The newlywed and newcomer packet programs are being continued by many home economists and serve as useful get-acquainted tools for Extension and usually lead to further clientele participation. Additional programs with young families include value clarification, family communication, children’s play and toys and child development.
Parents of young children and child-care workers participate in parent education through Head Start, parent groups, newsletters and group meetings. Many home economists also develop letters for professional and volunteer child-care workers.

Several family life seminars were conducted. Extension home economists are planning programs and seminars on death education, once an ignored topic but now a concern of many people.

Youth with special needs participate in classes for potential drop-outs, in youth leadership workshops, preparation-for-marriage lessons, babysitting classes, family relations group sessions, family life essay contests and camp counselor training programs.

Extension home economists help coordinate community agencies in assisting families through local resources. As a result, several interagency planning councils have been formed and are aiding in planning programs to meet the needs of their communities.

Radio, newsletters and news columns with messages for different age groups are used in every county.

**Clothing and Textiles**

Economy and energy conservation were the major concerns in many clothing programs. Extension news articles, radio programs and special classes stressed ways of extending the wardrobe and provided advance forecasting of coming styles and colors so families could take advantage of end-of-season sales. Learning to make clothes and make them look professional continues to be in demand and enables families to extend clothing budgets. A series of publications were developed to expand clothing construction techniques beyond the beginning series developed the previous year. Training and visuals were provided extension home economists. Energy conservation was promoted through mass media and two leaflets. Seasonal leaflets created an awareness of clothing that promotes the greatest conservation of energy.

Flame retardant nightwear for children brought many consumer questions on the TRIS matter. Specialists provided county staffs with information on the subject to guide consumers when buying or caring for flame retardant nightwear.

Extension and other home economists participated in a pilot training program on laundry products, equipment and techniques. The program was conducted through closed circuit television with a telephone hook-up for questions and immediate answers. Programs on stain removal and care of flame retardant nightwear provided home economists information to assist with consumer questions.
This was a multidisciplinary program with other extension home economics faculty members and a faculty member from Winthrop College.

Getting the most for your money is of interest to all consumers, especially parents of young families. Two new publications were developed on what to consider before making clothing purchases, one on maternity clothes, the other on buying clothes for the 6 to 12-year-old.

**Expanded Food and Nutrition Education Program**

The Expanded Food and Nutrition Education Program (EFNEP) is an integral part of the Cooperative Extension Service Home Economics and 4-H Youth Programs. EFNEP is designed to reach low-income audiences and to help them improve their dietary level and to become more efficient users of available resources. Program funds are earmarked, so guidelines are restricted to include only the teaching of foods and nutrition and related areas to the enrolled program families and youth. EFNEP consists of an intensive education on an individual or small group basis, conducted by extension para-professionals and/or volunteers trained and supervised by extension professionals serving low-income families and youth.

On August 3, 1976, Extension Committee on Policy (ECOP) approved revised policy guidelines for conducting the program. With these revisions, adjustments and evaluations were necessary in the state program. All 18 counties in which EFNEP programs are conducted were visited between October 1, 1976, and April 15, 1977, by the EFNEP coordinator to review these guidelines and explain their implications to the South Carolina program.

During the fiscal year all EFNEP counties were given individual training on how to use a new progression model. Since that time program assistants have been converting all family records to this system.

Within the past few months all counties have recruited and trained for vacant program assistant positions. Also in April 1977 a two-day training session was conducted for the program assistant group leaders (PA-GL) who had been employed in 1976-77. This concept was piloted in six counties in 1975 and its success prompted the approval for expansion to all counties this year. The PA-GL position in the county program gives more individual support to each program assistant, while focusing on efficiency of the home economist’s time and energies. Program assistant group leaders con-
fer and work with other program assistants one-half of their time and devote the rest of the time to work with their own program families.

Counties have been encouraged to involve graduated homemakers in the ongoing extension programs. In some cases these homemakers have continued to meet in groups, some of which have been organized into Extension Homemaker Clubs and/or special interest groups, thereby becoming recipients of all extension home economics subject areas. A large number of 4-H EFNEP youth also participated in the regular 4-H events and activities. Several of the 4-H EFNEP youth were in state 4-H competition this year at State Conference. One county had 3 finalists.

A special 4-H EFNEP camp, now an annual event, has succeeded in accomplishing many educational and social goals of the program. The 1977 camp had an attendance of 309 campers and 22 volunteer leaders, plus county and state professional staff. It was the first time the camp had participated in the U. S. Department of Agriculture’s Summer Feeding Program which enabled the camp to reduce fees to a nominal amount and allowed more EFNEP youth to attend.

In South Carolina the adult phase of the program is in operation in 18 counties; the youth phase is in 17 of these counties. Some 53,567 homemakers, representing about 241,248 family members, have benefited from the program from its inception in 1969 through March 1977. As of March 31, 1977, 4,121 homemakers were enrolled. During the year the youth phase section of the program reached 4,265 youth, 1,207 of whom were new to the program. A total of 515 volunteer leaders worked with the Expanded Food and Nutrition Education Program during the year.

Food Nutrition and Food Preservation

Gardening and food preservation are major methods for families to improve diets and stretch budgets and also serve as two of the most popular hobbies. Many families are growing and preserving food for the first time, while others need update information. In response to this need a food preservation handbook and leader training materials and kits were developed and provided each county. The handbook includes a home-study course, mass media materials and a question/answer section. Additional information on preservation of fruits and vegetables was included in a tabloid publication, Garden Manual, with which the food-nutrition specialist
assisted. One hundred thousand copies of the manual were printed and distributed throughout the State in early spring 1977. Responses indicate that families found the publication to be highly effective in both food preservation and gardening.

Another accomplishment was the completion of one-concept, easy-to-read leaflets in 11 areas of food preservation. These leaflets improved and replaced previously used canning and freezing bulletins.

One of the major accomplishments in food nutrition, the extensive use and positive results of the six-lesson home-study course, “Preschooler vs. Food,” was conducted in 38 counties and benefited many young mothers and preschool children. These lessons, emphasizing what and how to feed the preschool child, were used by approximately 1,200 mothers.

**Family Resource Management**

To meet the needs of local clientele more adequately, state and county staff members worked together to develop a series of leaflets on “Money Talks.” These leaflets cover 15 different topics relating to the family’s income and outgo. Topics range from food, clothing and housing to consumer rights and responsibilities, transportation and cost of child rearing. These publications are designed to be mailed to clientele on a regular basis to help individuals improve the use of their resources.

An interdisciplinary team from the Clemson Cooperative Extension Service including family resource management, housing and equipment, clothing and textiles, and an equipment specialist from Winthrop College, produced two 2-hour training sessions on laundry appliances, products and procedures. This training session was broadcast over closed circuit television from the ETV studio in Columbia to state technical education centers where home economists viewed the program. Participants included county extension home economists, high school home economics teachers and utility home economists. In addition to the taped information, participants received resource packets to aid them in presenting programs at the local level.

**Home Furnishings**

Strong emphasis is being given statewide to increasing the number and the effectiveness of volunteer adult and youth leaders.

A task force of extension personnel and volunteer leaders developed a plan for an intensive thrust toward 4-H leadership in South
Carolina. To support this aim a home furnishings specialist and an associate county home economist developed a seven-lesson series on "24 Hour Room Service." The series is designed to stimulate 4-H club members' interest in improving their home environment, to develop an appreciation of good design and to demonstrate their ability to apply principles of good design as they make improvements in their home.

This series was conducted as a pilot project in Spartanburg County with 375 in-school 4-H members participating. With packets which were prepared and distributed at the beginning of the series, leaders were able to provide assistance to club members and remind them of the purpose of the next lesson. Leaders used homework assignments to provide extra interest and emphasis on 4-H work. Participants gave a total of 779 demonstrations during the year. Some 200 of the 375 4-H members involved in the series turned in 200 high quality 4-H record books to the home economist. One-half of these received pins for excellence.

As a result of wide acceptance of this pilot program, in-service training in the implementation of this series was given to a home economist from each of the 46 counties. To supplement teaching materials, 10 leaflets have been developed and printed by the home furnishings specialist.

**Housing and Household Equipment**

Emphasis on energy conservation has increased as individuals and families make efforts to utilize resources more efficiently. Extension personnel have prepared and presented energy conservation information through mass media, special interest programs and club meetings. Two programs, one for middle income groups—"Weatherizing the Home," and one for low income groups—"Save Energy, Save Money, Weatherize Your Home,"—have been used throughout the State. These programs as well as a series of newspaper articles offer practical techniques which families with varying resources can employ to conserve energy and use monetary resources better. Other programs in energy conservation have stressed the use of small household appliances instead of large home appliances.

Fires are a very destructive force in South Carolina homes. In addition to property loss, death and injury to inhabitants often result. A special leader lesson on "Fires in the Home," including lesson content and visuals, was made available and used extensively by Extension Homemaker Clubs throughout the State.
4-H and Youth Development

Scope of Activity

No single Cooperative Extension Service concept or program is more widely known or recognized than 4-H. The technique of organizing young people into clubs through which extension programs can help youth gain practical knowledge and skills in agriculture, home economics and related areas was one of the early innovations in education, and it succeeded admirably.

4-H projects, strictly rural in the early days, have been diversified to appeal to teens in the urban areas as well. 4-H clubs provide opportunities to learn activities, enhance personal development through project work and to establish a formal vehicle for adult involvement. Many clubs join in constructive community projects.

In addition to clubs, 4-H uses many other means of meeting the needs of youth. Learning opportunities are provided through informal special interest groups, camps, educational television and tours.

In 1975-76, a total of 101,742 youth participated in 4-H activities, 70,000 in organized clubs, 15,685 through educational television, 7,871 through the Expanded Food and Nutrition program, and 865 in the 1890 Program.

Following are some program highlights.

Volunteer Leadership Development

Volunteers are the key to expanding and improving the 4-H program. Some 1,345 adult volunteer leaders gave time and effort to the 4-H program in 1976. Some 756 youth also served in leadership roles. Extension hopes to increase the numbers of volunteer leaders and is delineating new volunteer roles in the youth program to encourage more participation.

County extension workers are learning skills necessary to implement a volunteer-led 4-H program. Materials for training volunteers are being secured and multi-county leader training sessions held across the State reached more than 300 volunteers. Some 74 leaders attended a one-day forum at Clemson.

4-H Camping

A statewide effort is being made to increase 4-H camp attendance, develop new programs and improve camp facilities. In 1976, 4,326 4-H members attended camp for one week. Special interest camps
were held in the areas of dairy, conservation, electric, horse, community resource development and expanded food and nutrition.

Major improvements have been completed on physical facilities at Camp Long and at Camp Bob Cooper.

**Citizenship Shortcourse**

Thirty-six 4-H members from 15 counties explored current issues and democracy in action during a citizenship shortcourse in Washington, D.C. They studied the free enterprise system, energy resources and use, community development and responsibilities as citizens. Headquarters was the National 4-H Center where South Carolina delegates participated with 4-H teens from 12 other states.

**State 4-H Teen Leader Retreat**

The State 4-H Teen Leader Retreat held at Camp Long provided opportunities for members to explore personal concerns relating to values, attitudes, health and careers, and to further develop skills to use leisure time wisely. Some 166 teens from 38 counties participated in the training which was designed to prepare them to teach selected skills to others in their home communities.

**State 4-H Conference**

The 14th annual State 4-H Conference was held at Clemson University this year, with more than 550 members and agents attending. The youths met with subject matter specialists for educational training in more than 40 program areas. They had an opportunity to see a bicentennial drama, participate in recreation programs and to be recognized for outstanding accomplishments.

4-H record books were judged and awards given for blue, red and white ribbon placings. State winners also were announced.

A 4-H Leader Forum was held during the week, with 66 volunteer leaders and 7 program assistants from 24 counties attending. Leaders also were given information on various project areas and low cost crafts.

**Community and Resource Development**

**Scope of Activity**

The Community and Resource Development (CRD) program is designed to provide educational and technical assistance to groups interested in improving the level of services and quality of life in their communities and concerns problems requiring collective action to achieve a solution. The present focus of the CRD effort is en-
environmental improvement, leadership and problem identification surveys, community services, community facilities development, the provision of assistance pertaining to federal grant and loan programs and coordination with other organizations and agencies in conducting effective community development activities.

**Major Emphasis**

The major emphasis of the CRD program involves providing information, education and technical assistance to support community development projects. These include the identification of community problems and potential leaders; the organization of action committees; leadership training; and technical assistance in developing services such as fire protection, water and sewer, recreation and health; environmental improvement planning for appropriate land use; and crime prevention. The major philosophy of CRD involves organizing people to act on local problems by promoting and developing their organizational and leadership skills. A variety of problems requiring group action can be addressed at the local level through indigenous leadership.

**Environmental Improvement**

County participation in the Governor’s Beautification and Community Improvement Program continues to increase. County committee plans for litter clean-up campaigns, abandoned car and delapidated building removal represent a substantial component of the environmental improvement efforts, but concern with beautification through flowers, plants, trees, and other forms of vegetation indicate an increased awareness of the potential for improving environmental amenities through visual enhancement. The program also helps prevent environmental degradation resulting from soil erosion, sedimentation and other sources of pollution-causing run-off.

**Leadership and Problem Identification Surveys**

South Carolina communities are becoming more aware of the need to augment their existing leadership resource base as the need to address community problems becomes more pressing. Problems arise from two conditions: dwindling population in some areas due to a lack of job opportunities, and increasing population in other areas creating a demand for additional services. In addition, federal and state regulations and requirements often require citizen involvement in assessing needs and assisting implementation. The existing reservoir of community leadership finds itself greatly taxed in at-
tempting to respond to community needs. This situation, coupled with increased authority and responsibility on the part of local government through recently enacted “home rule” provisions, has brought about a growing demand for assistance in identifying community problems and needs and in locating new sources of community leadership to assist in addressing these needs. Extension CRD personnel have developed and are refining a process to aid communities seeking assistance and is being called upon with greater frequency to provide this service.

**South Carolina Community Development Association**

The South Carolina Community Development Association is an organization consisting of representatives from a number of agencies, organizations, and individuals concerned with community development. Its purpose is to improve communications, cooperation, and effectiveness of community development programs in South Carolina. CRD personnel were instrumental in the formation of this organization and continue to be an effective component in its activities.

**The Federal Assistance Programs Retrieval System**

CRD personnel instituted a computerized process through which federal grant and loan assistance program information applicable to specific development-related projects can be identified. Individuals, organizations and agencies seeking information through the system have to provide only certain basic information about the requester, the type assistance sought and the project location. With this information, CRD personnel are able to assess the system and generate a computer printout listing the various federal grant and/or loan programs available. To date requests for assistance have come from a variety of sources including local community development groups; local, county, and state agencies; governmental units; planning and development commissions; and other universities.

**Community Services and Facilities**

CRD personnel have produced significant educational information on a variety of community services including countywide fire protection, emergency medical services and rural water systems. Activities have included publication of a brochure on countywide fire protection, articles and other information underlining the need for emergency medical services, and publication and distribution of information discussing the process involved in establishing rural
water systems. CRD personnel are continuing to assist in the development process for establishing a Human Resources Campus for Williamsburg County which will house the county’s major health and social service agencies.

**1890 Extension Program**

**Scope of Activity**

The primary aim of the 1890 Extension Program is to provide educational training for enrolled low-income families in youth development, family living and community resource development.

Programs conducted by South Carolina State College in cooperation with the Clemson University Extension Service provide education and outreach to segments of the population not in touch with traditional uplift programs.

**Gardening Project**

A small farms and urban gardeners program was initiated in Anderson County with approximately $56,000 allocated for the program during 1976. All funds have been designated for limited resource families.

An increased number of 1890 program families are producing quality vegetables in excess of home consumption needs. They utilize a local community market, constructed by Anderson County, to sell this excess and increase the family income. This demonstration model shows considerable promise and will be expanded to other counties as soon as funds are available.

Similar projects with small farmers exist in Georgetown, Hampton and Marlboro counties. On June 16, 1977, a Vegetable Garden Tour was held in Marlboro County, including 77 garden participants from five communities.

**Home Economics Program**

Home economists introduced and provided new educational training for hard-to-reach families who showed a willingness to improve the quality of life through creative and productive use of available resources.

Home visits by paraprofessionals, group meetings, leaflets, demonstrations, tours, exhibits and community projects extended educational programs.

Community projects provided new education opportunities for some 300 limited resource families. Projects included bazaars, fair exhibits, quilting bees, sewing and canning clubs.
**Rat Control Projects**

Rat control projects are being conducted in three phases—workshops to teach living habits of rats and mice; instruction in how to kill existing populations; and demonstrations on how to minimize the environmental conditions conducive to rat growth and development.

Through cooperation among county environmentalists and other officials in Georgetown, Hampton and Marlboro counties, 1890 personnel successfully conducted three community-wide rat control programs.

Anti-coagulant poison bait was used to kill rats in homes of some 900 families in 10 communities. Test results revealed rat populations were lowered to levels where their presence was not noticed.

The rat control program was initiated in 1973 in one community of each of the four counties. In 1975 the program was expanded to 6 communities in Hampton County, 3 in Georgetown, 3 in Marlboro and 1 in Chesterfield. An adequate countywide rat control program is established with a five-year goal (1973-1978).

**Summer Camps**

The sixth annual 1890 summer camping program, conducted at Camp Harry Daniels in Elloree, attracted 368 youths, ages 9-16, from limited resource families.

The camp was operated as a model community with each participant assuming the role of someone who provides a community service. Camp counselors served as advisors.

Camp activities are designed to enhance behavioral goals among youths, both socially and psychologically. Realizing recognition as an incentive to promote ideals of youths, ribbons and certificates were awarded for outstanding accomplishments.

**Special Programs**

**Small Farmers and Limited Resource Families**

The Extension Service for more than six decades has been charged with the responsibility of translating scientific knowledge from university and Experiment Station research into useful application on farms, in homes and communities. Despite the fact that the number of farmers continues to decrease as size of operation increases, the small farm with limited incomes is still a way of life for many of the state's rural residents. Also, in many areas of the State an exodus back to the rural areas has resulted in some involve-
ment with the soil by many people who lack a substantial income as well as knowledge in basic management including planning, soil preparation and fertilization, pest management, livestock management, and harvesting and marketing farm products.

According to the latest available data about one-half of the farms being operated in South Carolina are grossing less than $2,500 annually. Experience has shown that changes in managerial practices by many of these farmers can be expected only by a more intimate contact than is provided through traditional extension programs.

To increase the participation of small family farms in agricultural programs, extension’s “Special Programs” developed projects in what may be termed as “low-income agriculture.” Area agents (professional) and agriculture science assistance (paraprofessional), working with county extension staff, developed projects involving small family farmers and low-income clientele in an effort to create more stable family enterprises by (1) providing technological assistance needed to improve efficiency, and (2) increasing incomes through efficient production and marketing systems. Special program committees, made up primarily of clientele from limited resource families and agency personnel working directly with these families, helped extension personnel identify areas in which help was needed. Emphasis was placed upon the following activities involving small farmers and limited resource families:

1. Demonstrations:
   (a) All-practice demonstrations of row-crops produced on the farm, utilizing the latest in scientific methods of production in such areas as fertility, herbicides, insects control and harvesting.
   (b) Swine feeding demonstrations for top hog markets and feeder pig production demonstrations for feeder pig market.

2. The production and marketing of horticultural crops such as okra, beans, tomatoes and cucumbers.

3. The production of home gardens on individual family and community bases in youth and adult programs.

4. Providing educational information through personal contacts, tours, workshops and the media.
Newberry County

Extension carries out a continuous program involving agriculture, youth, home-gardening, nutrition, physical fitness and clothing for the low-income farmers in Newberry County.

Some 20 low-income families are reached in addition to those contacted through the youth program. Improved row crop yields and small grains with less insect and disease damage indicate progress for these families. An annual “Crops Production” meeting brings modern farming techniques to the low-income farmer as well as other farmers.

These programs reached some 600 youth from low-income families through activities such as the 4-H Achievement banquet and 4-H Jamboree. Another five families were reached with the 4-H Poultry chain through which low-income members receive pullets to raise. 4-H’ers are encouraged to attend special events and to participate in county fair exhibitions. Members with special interests are visited regularly and given necessary assistance.

Assisting low-income families with home gardening helps supplement food supplies while developing a sense of pride for the environment. Some 60 low-income families were assisted in home gardening. Another 50 low-income families were assisted in CRD work.

Clothing and physical fitness programs were developed to encourage a sense of pride in personal appearance. Sewing classes and physical fitness and diet classes were successful.

Approximately 230 families were reached through nutrition programs designed to help family members become more aware of proper diets.

Workshops, meetings, media and direct mail contacts are used to inform the public of the availability of the programs.

Orangeburg County

The scope of activities in Orangeburg County included shaping the future, food buying, using credit and food preservation.

The “shape your future” program was conducted over a three-month period and reached 30 families. A part of the “Partners Program,” designed to help young people having problems with the law, at home or in school, it encourages youth to understand the effects proper diet, exercise and body care have on appearance and personality. They are encouraged to share information with their families and others.
Families reached through food buying programs are making better use of food stamps and have learned shopping skills. Some 157 people were reached.

The 158 people reached through credit programs have a better understanding of interest charges, credit ratings, and where to get and how to use credit.

More home gardens, more exhibits in county fairs and a greater number of requests for assistance resulted from food preservation programs. Some 95 people learned better methods of food preservation.

Vance Project
A special programs community project carried out in the Vance area of Orangeburg County includes swine production, vegetable production, gardening, soil fertility, drainage, 4-H pig chain, 4-H poultry chain and other miscellaneous 4-H projects. A special extension agent serves some 300 low-income families in the 10 square-mile community.

The swine project has been very successful, placing quality breeding stock on 15 farms. These farmers are now marketing feeder pigs and market hogs.

More than 60 families were reached through evening workshops on home landscaping and home improvement. Home maintenance instruction was part of the program.

Adult volunteer leaders and 200 EFNEP youth received lessons and personal hygiene kits put together by individuals, organizations and churches. Lessons were taught to program assistants and youths on home flower gardens. Some 300 young people planted bulbs, donated by the Greenwood County Beautification Commission, in their communities.

Low-income CRD programs emphasized involving more disadvantaged people in sanitation and beautification projects; incorporating safety preparedness educational programs for disadvantaged youth and adult groups; incorporating an educational program on disaster preparedness; improving the diets of youth and adults in low-income families enrolled in EFNEP; increasing volunteer leaders' knowledge of opportunities for youth and adults of EFNEP; encouraging low-income groups to produce home gardens and learn food preservation; and helping limited income families gain skills in landscaping and home improvement.
Greenwood County

Greenwood County special projects involved low-income agriculture, low-income gardening, EFNEP clean-up, education and low-income CRD.

As a result of the extension program many low-income farmers are using improved plant varieties; soil testing and improved livestock management. Three men agents worked with some 35 low-income farmers during the year.

The Extension Service conducts community garden sites for 60 families in four areas and offers educational programs centered on helping people help themselves. Demonstrations during growing seasons provided examples of cultivation methods, pest management and harvesting techniques. Program aides teach families, on an individual basis, how to cook and prepare vegetables for freezing or canning. Families involved in the program have grown from a state of high dependency to one of independence and have developed pride in their abilities.

The Special Programs committee organized groups to beautify and clean up their communities by removing junk cars, dilapidated buildings and litter. Some 197 EFNEP youth in Greenwood got rid of trash and junk in their own yards and adjacent property in their neighborhoods. Ten youths cleaned up their surrounding neighborhoods and 20 others took part in a one day clean-up around public buildings. They also unloaded cars for people who brought items to a recycling site.

Several programs designed for drop-outs or persons desiring training in special areas were carried out for several months at Piedmont Technical Education Center. Programs included house repairman, textile machine operators, production machine operators, nurse’s aide and welding. Food and nutrition workshops gave information to 130 people. Some 75 disadvantaged persons enrolled in one program and some are already working with new skills while others are completing training.
Appropriations for Extension Service

1976-77

State Appropriations ........................................ $ 5,237,008
Federal Smith-Lever ........................................ 3,593,895
Federal Resource Conservation and Development .......... 14,241
Federal Nutrition Fund ...................................... 1,611,104
Federal Smith-Lever 1890 College ......................... 479,027
Federal Smith-Lever Rural Development ..................... 64,410
Federal Smith-Lever Cotton Project ......................... 111,271
Miscellaneous Sales and Fees ................................ 51,456

Total Appropriations ........................................ $11,162,412

Expenditures by Object Classification

1976-77

Classified Employees ........................................ $ 4,316,599
Faculty and Staff ............................................. 3,659,115
Graduate Assistants ........................................... 16,959
Students and Part-time Temporary Help ....................... 156,814
Fringe Benefits ................................................. 826,657
Travel .......................................................... 614,472
Contractual Services .......................................... 351,645
Postage, Supplies and Materials .............................. 180,480
Rents and Fixed Charges ...................................... 53,868
Equipment ..................................................... 51,032
Permanent Improvements ..................................... 51,943

Total Expenditures ............................................ $10,279,584

Balance Carried Forward June 30, 1976 ......................... $882,828

$11,162,412
DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS

L. H. Senn, Director

This division of Clemson University operates several consumer protection-type programs that are closely related to the agricultural sector. The philosophy for having some regulatory-type programs at Clemson is that certain regulations can be enforced more effectively when strong educational approaches are used. Regulatory and Public Service Division personnel use this technique as a normal procedure.

It maintains close coordination with the Cooperative Extension Service and the S. C. Agricultural Experiment Station and solicits their aid when additional educational and research efforts are needed. Strict enforcement is used only against recalcitrant offenders.

The major objective of this division is to ensure consumers buying lime, fertilizers, pesticides and seed get the qualities indicated on tags or labels. It also enforces regulations of the Crop Pest, Bee Disease and Abandoned Orchards Acts and imposes quarantines when needed.

The division was also given the responsibility for enforcing the new South Carolina Pesticide Control Act. During 1976 the South Carolina Agricultural Liming Materials Act was passed and enforcement responsibilities were given to the division.

The following report highlights the activities of the division during 1976-77.

Plant Pest Regulatory Service

South Carolina Pesticide Control Act

This act is now two years old, and overall the certification program is progressing smoothly and according to the state plan.

As of June 30, 1977, 6,566 private applicators, 1,103 commercial applicators and 42 pesticide dealers have been certified and licensed under the act to sell, purchase and apply "restricted use" pesticides. Certification fees collected total $21,008.25.

Under the registration aspect of the act, 510 companies registered 5,018 products. The total number of pesticide samples collected and analyzed was 1,491. Eighty-four (5.4 per cent) were deficient in one or more components. The department collected $87,582.25 in registration fees.
Eleven enforcement actions were taken. These involved seven hearings for pesticide companies selling unregistered products in the State, two cases of pesticide misuse and two "stop sales" on unregistered products. Many other complaints of misuse involving agricultural pesticides and structural pest control materials were investigated and, in most instances, no violations had occurred.

Public hearings were conducted on the regulations promulgated under the S. C. Pesticide Control Act at four locations in the State. They were then put in the format to conform with the Administrative Procedures Act, No. 671, and forwarded to the legislature for approval.

Other items of significance included the issuance of three Section 18, specific exemptions, and nine Section 24 (c), special local need, registrations in accordance with the Federal Pesticide Control Act. The Section 18 exemptions granted included the use of Vydate on tomatoes for leafminer control; the use of terramycin on peaches for bacterial spot control, and the use of three new pyrethroids and one organophosphate on cotton for control of bollworms and tobacco budworms.

Nursery, Bee, and Sweet Potato Inspections

A total of 696 nurseries, greenhouses and vegetable transplant growers were inspected and certified to sell and ship plant materials. Nursery dealers certified in the State total 733. This represents a 15.5 and 4.5 per cent increase over last year in the number of nurseries and dealers, respectively.

Numerous other inspections of assorted house plants, nursery stock and agricultural commodities, destined out-of-state or to foreign countries, were made and proper certificates issued.

Approximately 50,000 peach tree seedlings destined for commercial plantings were inspected. Of these, 7,400 trees were destroyed because of excessive, visible infection with crown gall disease. Another 500 were returned to the shipper because of evidence of crown gall.

Inspections of other incoming nursery stock, foliage plants and vegetable transplants resulted in eight "stop sales" being issued because of disease problems primarily.

Approximately 3,600 bee colonies were inspected with only 0.64 per cent found infected with foulbrood. A total of 194 colonies were inspected and certified for movement to other states, primarily Florida and North Carolina.
Fifty-three sweet potato inspections, including storage, plant bed and field inspections, were performed for 22 growers in 12 counties. Regular and certified seed stock was involved.

**Phony Peach**

Approximately 1.8 million peach trees were inspected for phony peach disease during the 1976 survey season. One thousand five hundred and seventeen (1,517) were diseased and destroyed, compared to 664 last year.

Extremely cold weather this past winter, coupled with problems in finding and hiring temporary personnel, hindered our wild plum herbiciding program. However, 76 acres of wild plums were treated for growers in seven peach producing counties in the Ridge and Coastal Plains areas of the State.

**Cooperative State-Federal Programs**

**Imported Fire Ant:** Plans for a fall aerial treatment program were canceled because of a shortage of Mirex bait and other controversies surrounding its human and environmental effects.

However, ground control treatments are continuing. This year marks the beginning of the third year of pasture treatment work utilizing a jeep mounted electric seeder. Treatments were applied to 1,661 acres of pasture in four infested counties. Mirex 10-5, utilizing a lower percentage of active ingredients, is now being used in the place of Mirex 4X. The use of Mirex 4X was suspended as of December 31, 1976.

**Pest Detection:** Imported fire ants were found for the first time in Greenwood and York Counties. All existing mounds were treated and subsequent surveys were negative.

Three gypsy moths were trapped at campgrounds in Horry and Clarendon Counties. The catch in Clarendon County constituted a new county record. To the best of our knowledge, this pest is not established in the State.

Dutch Elm disease was confirmed in only one new county during the year, increasing to 18 counties in which it has been confirmed.

**Witchweed:** Infestations, comprising 631 acres, were found on 10 new farms, all of which were within the current quarantine areas. A total of 9,090 acres received one or more herbicide applications for witchweed control for an aggregate of 23,412 acres treated. Chemicals used were 2, 4-D and paraquat.

A total of 5,458 and 823 acres was treated with ethylene and treflan, respectively. Ethylene causes witchweed seed to germinate
and therefore, is a valuable tool in this program. Treflan is also important to the witchweed program because of its applicability and use in home gardens.

**Department of Fertilizer Inspection and Analysis**


Some of the major activities of the department for the July 1, 1976-June 30, 1977, period follow:

<table>
<thead>
<tr>
<th>Activity</th>
<th>1976-1977</th>
</tr>
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<tbody>
<tr>
<td>Fertilizer usage data—tons</td>
<td>985,160</td>
</tr>
<tr>
<td>No. of fertilizer samples procured and analyzed</td>
<td>5,928</td>
</tr>
<tr>
<td>Total number of fertilizer samples not meeting guarantee</td>
<td>1,319</td>
</tr>
<tr>
<td>Percent of fertilizer samples deficient</td>
<td>22.3</td>
</tr>
<tr>
<td>Number of lime samples procured and analyzed</td>
<td>263</td>
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<tr>
<td>Total number of lime samples not meeting guarantee</td>
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<tr>
<td>Percent of lime samples deficient</td>
<td>7.9</td>
</tr>
<tr>
<td>Number of irregularities other than underweight</td>
<td>8</td>
</tr>
<tr>
<td>Number of irregularities for underweight at dealers' warehouses</td>
<td>6</td>
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<tr>
<td>Penalties collected, payable to state treasurer</td>
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<td>(Deficiencies where consumers not identifiable)</td>
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<td>No. of fertilizer samples procured and analyzed</td>
<td>5,928</td>
</tr>
<tr>
<td>Total number of fertilizer samples not meeting guarantee</td>
<td>1,319</td>
</tr>
<tr>
<td>Percent of fertilizer samples deficient</td>
<td>22.3</td>
</tr>
<tr>
<td>Number of lime samples procured and analyzed</td>
<td>263</td>
</tr>
<tr>
<td>Total number of lime samples not meeting guarantee</td>
<td>21</td>
</tr>
<tr>
<td>Percent of lime samples deficient</td>
<td>7.9</td>
</tr>
<tr>
<td>Number of irregularities other than underweight</td>
<td>8</td>
</tr>
<tr>
<td>Number of irregularities for underweight at dealers' warehouses</td>
<td>6</td>
</tr>
<tr>
<td>Penalties collected, payable to state treasurer</td>
<td>$985,160</td>
</tr>
<tr>
<td>(Deficiencies where consumers not identifiable)</td>
<td>$5,928</td>
</tr>
<tr>
<td>Fines collected, payable to state treasurer</td>
<td>$1,319</td>
</tr>
<tr>
<td>Fertilizer registration fees collected, payable to state treasurer</td>
<td>$22.3</td>
</tr>
<tr>
<td>Lime registration fees collected, payable to state treasurer</td>
<td>$263</td>
</tr>
<tr>
<td>Lime permit fees collected, payable to state treasurer</td>
<td>$21</td>
</tr>
<tr>
<td>Fertilizer taxes turned over to state treasurer</td>
<td>$7.9</td>
</tr>
<tr>
<td>Total monies sent to state treasurer</td>
<td>$276,896.82</td>
</tr>
</tbody>
</table>
Fertilizer Movement

Fertilizer movement was very slow during the first part of the fiscal year, and fertilizer tonnage lagged behind the previous year's figures through January. However, once the season got underway, tonnage increased, resulting in the second highest year on record, falling behind only the 1948 record. Tons of primary plant nutrients sold during 1976-77 were the highest sold, since analyses of fertilizer grades are much higher than in 1948-49. For the year, the mixed fertilizer tonnage was 6.8 per cent more and the nitrogenous materials tonnage 7.4 per cent more than the previous year. Total mixed fertilizer and materials tonnage was 7.9 per cent more than the 1975-76 year and 23.3 per cent more than the 1974-75 year. Nitrogenous materials tonnage was 31.5 per cent more than 1974-75.

New Agricultural Liming Materials Act

The Agricultural Liming Materials Act became effective July 1, 1976. Preliminary figures indicate that approximately 7.9 per cent of lime samples taken were deficient when compared to the guarantees.

Department of Seed Certification

Seed certification is a program of standards imposed on seed and plant production that insures varietal purity and good germination. Participation of farmers in the program is voluntary.

The Clemson University Department of Seed Certification was designated by South Carolina law in 1945 as the official agency for certifying seed and plants in the State. Standards of seed certifying agencies in the United States are required to meet standards for certification of seed in Federal Seed Act Regulations.

Field work of the department in 1976 involved inspection of 50,858 acres of crops. This work included inspections of 67 varieties of 10 crops for the 310 South Carolina farmers and 26 seed-producing firms participating in the program. Each field was inspected to determine that the crop was true to variety and free of noxious weeds.

Major crops in the program with acreages inspected in 1976-77 were soybeans (22,778), small grains (8,086) and cotton (12,859). This represented decreases of 9,249 for soybeans and 3,468 for small grains as compared to acreages certified in 1975-76. However, cotton certification increased by 5,813 acres and the 1,767 acres of peanuts inspected was the second largest acreage ever for certification in South Carolina.

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In addition to field inspection work, the department issued 774,598 certification tags for use on 825,081 bushels of South Carolina certified seed in 1976-77.

Unfavorable weather for seed crops production continued in 1976-77 and yields were reduced as a result. Excess rainfall in many areas in June and July delayed development of young soybeans and cotton. With root systems of these crops stunted by too much moisture, dry weather began in August and continued into September. These conditions resulted in yield reductions of 40-50 per cent for cotton and approximately 30 per cent for soybeans. In addition to yield losses, soybean maturity was delayed 2-3 weeks. Some 3,200-3,500 acres of soybeans were lost for use as certified seed because of lowland flooding in the Congaree River bottoms at Columbia in early October.

The delayed soybean maturity resulted in delayed planting of small grains in the fields after soybean harvest. With the delayed planting and prolonged severe cold of the winter, many small grain stands were thinned drastically. In early April dry weather began and many areas received no substantial rainfall until after small grains were harvested in June. Reduction of yields ranged from 10 per cent to 50 per cent less than normal.

The same lack of rainfall that reduced small grain yields produced spotty stands of cotton which improved very little even with replanting. Soybean planting was halted approximately two weeks over most of the State. Some local areas experienced drought so extreme that some corn was plowed up. The drought was broken in some areas by local thundershowers in late May and June, but, as of mid-June, a few areas still had experienced no appreciable rainfall.

The only seed quality problem of any consequence experienced during the year was with early maturing varieties of soybeans. The germination standard for seed of the varieties Coker 136, Davis, FFR-666, Forrest and McNair 500 was lowered from 80 per cent to 70 per cent because of some germination problems and the need for these seed in planting the 1977 soybean crop.

Purchases and prices of soybean seed in the spring of 1977 were unprecedented. Virtually all soybean seed produced in South Carolina had moved to growers approximately two weeks before earliest recommended planting dates. Reports of prices being paid by farmers for certified seed ran as high as $18.75 per bushel and much
nondescript seed sold as high as $16.00 per bushel after good quality seed was no longer available.

In 1974, the national seed certifying agency, The Association of Official Seed Certifying Agencies, took upon itself self-policing of member agencies' standards and procedures. This was done to insure that each agency's standards and procedures complied with Federal Seed Act Regulations. As a result of these evaluations of standards, all seed certifying agencies in the United States were required to make some changes in standards. Seed certification standards in South Carolina were revised to bring about full compliance and were put into effect on April 1, 1977.

**LIVESTOCK-POULTRY HEALTH DIVISION**

Carl Boyd, Director

The Livestock-Poultry Health Division conducts a number of animal regulatory programs in the field of consumer protection and in the area of animal health and the diagnosis of various disease problems in South Carolina livestock.

The division's three main areas of responsibility are the Diagnostic Laboratory, the Livestock Regulatory Programs and administration of the State Meat and Poultry Inspection Program. Personnel of the division are located throughout the State to provide the inspection services provided for by law.

The Animal and Plant Health Inspection Service, U. S. Department of Agriculture, cooperates with the Livestock-Poultry Health Division in carrying out certain animal disease eradication programs, which are being conducted on a national basis and also provides 50 per cent of the funds for administering the S. C. Meat and Poultry Inspection Program.

Highlights of the division's activities for the year follow.

**Meat and Poultry Inspection**

This division entered the field of consumer protection in 1967 when the General Assembly passed the S. C. Meat and Meat Food Regulations and Inspection Law and assigned Clemson University the responsibility for the administration of the law. Two years later the S. C. Poultry Products Inspection Act was passed. The division's responsibility covers the wholesomeness of meat and poultry and the food products slaughtered and processed at all processing plants in the State except for seven plants that operate under Federal jurisdiction.
A total of 136 red meat plants in 43 counties and 47 poultry plants in 17 counties were under state inspection at the end of the fiscal year. The full-time staff consists of nine veterinarians, 77 inspectors, a compliance-evaluation officer and a secretary. More than 100 million pounds of red meat and poultry and almost 200 million pounds of processed meat and poultry products were inspected in state-inspected plants during the year.

**Livestock Regulatory Programs**

These programs are conducted in cooperation with the federal government, which supplies personnel and funds on a 50-50 basis to administer the national animal disease eradication programs.

**Brucellosis**

South Carolina was declared Certified Brucellosis-Free effective March 31, 1972, by the U. S. Department of Agriculture. Extensive use of two screening programs to find infected herds—Market Cattle Identification and Brucellosis Ring Test—played an important role in eradicating brucellosis in South Carolina.

The division continues to monitor dairy herds in South Carolina by the brucellosis ring test four times a year and to test all replacement cattle at stockyards. This is necessary to prevent the introduction of the disease in animals imported from neighboring states.

**Hog Cholera**

The last case of cholera in South Carolina was reported on November 2, 1972. After six months without an additional case, the State was declared Hog Cholera “Free” on May 4, 1973. A surveillance program is continuing on South Carolina swine to make sure the disease does not get back into the State through infected or exposed imported swine. The Secretary of Agriculture’s Advisory Committee on Hog Cholera Eradication has recommended the nation be declared officially free of the disease 18 months after the last positive case is diagnosed in the U. S. This will be followed by a three-year surveillance program.

The South Carolina Garbage Feeding Law became effective July 1, 1973. The law prohibits the feeding of garbage to swine because of the danger of hog cholera virus being spread to susceptible hogs in this manner.

An import regulation was approved in March 1977 by the Clemson University Board of Trustees which requires all imported breeding swine to have a negative pseudorabies test prior to entry.
An extensive outbreak of pseudorabies in the midwest this year has made this requirement necessary.

**Animal Diagnostic Laboratory**

The new post-mortem building and incinerator for the Diagnostic Laboratory were completed in January 1977, and are now being fully utilized for large and small animal diagnostic work. Portions of the old building were renovated to expand and improve the poultry diagnostic facilities.

The laboratory is presently staffed by seven veterinarians and 11 technicians. It provides diagnostic services in animal pathology, bacteriology, virology and serology for the state-federal regulatory programs as well as diagnostic help to practicing veterinarians and livestock or poultry owners in the State. The laboratory is in a position to isolate and identify many diseases of animals which are impossible to differentiate clinically. During this year the laboratory handled more than 3,000 cases and conducted more than 200,000 laboratory tests and examinations.