



1975 Annual Report A Year of Progress



Where We Are - 1975 in Retrospect

The year 1975 marked the 100th anniversary of the establishment of the first Agricultural Experiment Station in the United States, thus initiating a concept – public support of agricultural research – that has had a significant and lasting effect on the development of our country. During the year, this event was recognized in Alabama and throughout the Nation in many ways. The Farm-City Committee of Alabama joined together with this Agricultural Experiment Station to sponsor an Agricultural Appreciation Day on November 13 in Auburn to commemorate this day in history and to provide an audience for the premiere showing in Alabama of a film entitled “Unfinished Miracles.” The film tells a powerful story of the results of public supported agricultural research in the free enterprise system of this Nation.

The 1975 Yearbook of Agriculture entitled “That We May Eat” also tells the success story of the Agricultural Experiment Station programs in the past and then projects for the future.

In 1964, Dr. Zvi Griliches, Professor of Economics, University of Chicago, in a study financed by the National Science Foundation and the Ford Foundation, concluded that each additional dollar spent on agricultural research and education leads to an additional return of \$13 per year. I would like to see this study repeated today. The returns would probably be even greater. Public supported research in the Agricultural Experiment Station, and education in the School of Agriculture and the Cooperative Extension Service are basic components of the success of America.

Throughout this centennial year, those who serve their fellow man in public supported scientific endeavors were ever mindful that this Nation has now become part of a world economy, therefore increasing the challenge. As we look forward to developments in our Nation’s third century, it is comforting to know that we need not step blindly forward. We can and should prepare for the future through improved research and education. There is a challenge for leadership today in food and fiber production to a degree almost beyond comprehension. North America and Australia are the only areas of the world which are consistent net exporters of grain. This means our world population is close to the world food production limits. Yet, the record of population growth shows the world population to be expanding very rapidly.

From the dawn of civilization to 1830 was required for man to reach one billion inhabitants on this earth. Only 100 years was required for the world population to increase by a second billion (in 1930). The third billion of population was reached in 30 years (1960). Before the middle of 1976, only

16 years later a total of 4 billion people will be living on this planet. In another 9 years, by 1985, we can expect 5 billion.

Regardless of what happens to slow down population increase, it seems certain there will be some 6 or 7 billion by the year 2,000, and that’s only 24 years away. During 1975, this Agricultural Experiment Station has been working to prepare for these additional people. Progress was made in developing the kind of field research facilities that will be required. Progress was also made in staffing and in more adequately funding ongoing research of high priority through some special funding by the State Legislature. It is vital to the future of Alabama, the Nation, and this world that we not step blindly into the future – especially when we have the tools of the Agricultural Experiment Station to light the way. I am tremendously impressed with the progress that was made by your Agricultural Experiment Station during 1975. The great number of areas in which new knowledge and understanding was achieved.

Dr. John Cottier, Professor of Poultry Science, who has taught students of the School of Agriculture and the School of Veterinary Medicine about poultry and poultry diseases and conducted research in poultry management for 45 years and in 1975 was the senior member of our faculty, reviews the history of agriculture at Auburn and portrays a tremendous history of leadership. This is a great story, but the research accomplishments of 1975 are even more important to the people of Alabama and this Nation. Won’t you join me in reviewing these accomplishments in the pages that follow.

One closing thought: In 1975, the people of these United States were concerned, among other things, about the state of the economy, about inflation and joblessness. The concern should be about productivity. Agriculture produced enough agricultural products to feed this Nation and export \$22 billion of agricultural products. Each \$1 billion in exports is reported to create 53,000 jobs. Thus, these agricultural exports alone reduced unemployment in this Nation by over one million jobs.

Agriculture is beautiful!

“I believe in farming because it makes all things possible.”

R. DENNIS ROUSE, Director
AGRICULTURAL EXPERIMENT STATION
MAY 1976/2M

"The partnership of publicly financed research and education tied with a privately oriented agriculture is the magic mixture." This statement was made by R. Dennis Rouse, present director of the Agricultural Experiment Station; to explain the purpose of the experiment station.

Agricultural research efforts, Rouse believes, must be continued and intensified if future generations share the legacy that we inherited — a nation and a world in which human beings can enjoy the wonders of a wholesome life. The director's contentions for the future become more significant in viewing the highlights of the past.

The Alabama Agricultural Experiment Station was established by an act of the Legislature February 23, 1883 at the Agricultural and Mechanical College of Alabama, which is now Auburn University. A farm of 226 acres adjacent to the college was purchased with \$30,000 appropriated by the Legislature. The land was in poor condition and much of it had been abandoned for cultivation.

To support research at the new station, the state approved the use of one-third annual net proceeds from a tax on commercial fertilizer. In return, the college was to make analyses of fertilizer on request and without charge.

Auburn has been involved in agricultural research for over 100 years because prior to the initiation of experiment station, Agricultural and Mechanical College of Alabama conducted experiments on crops and fertilizers in three different locations in the State. These were at Auburn, the Tennessee Valley near Courtland, and at Boiling Springs in Wilcox County. (No funds for experimentation were actually available until 1883.) But experiments at the Tennessee Valley and the Wilcox County farms were discontinued with establishment of the main station at Auburn.

In 1887, Congress passed the Hatch Act and in 1888 the State Legislature accepted the provisions of the act and designated Auburn as the site for the station. The Agricultural and Mechanical College of Alabama Board of Trustees reorganized the station under provisions of the act. It provided \$15,000 annually for the furthering of experiments throughout the State. For the first few years \$2,000 of the amount was allocated to the Canebrake Experiment Station near Uniontown, the first substation. It was established by the 1884-1885 session of the Legislature to help farmers in the prairie section of Alabama.

In 1927, the Alabama Legislature appropriated money for the establishment of substations in five major soil regions and ten experiment fields for important, but less extensive soils. Three other substations were established on major soil regions between 1943 and 1945.

Two horticulture substations were started in 1948; and early in 1946 the station established a plant breeding unit for development and improvement of agronomic crops. Homer Tisdale and Jimmy Dick located this farm as one suitable for research aimed at the development of wilt resistant, root knot nematode tolerant cotton. The Ornamental Horticulture Field Station at Spring Hill, in Mobile, was established in 1951.

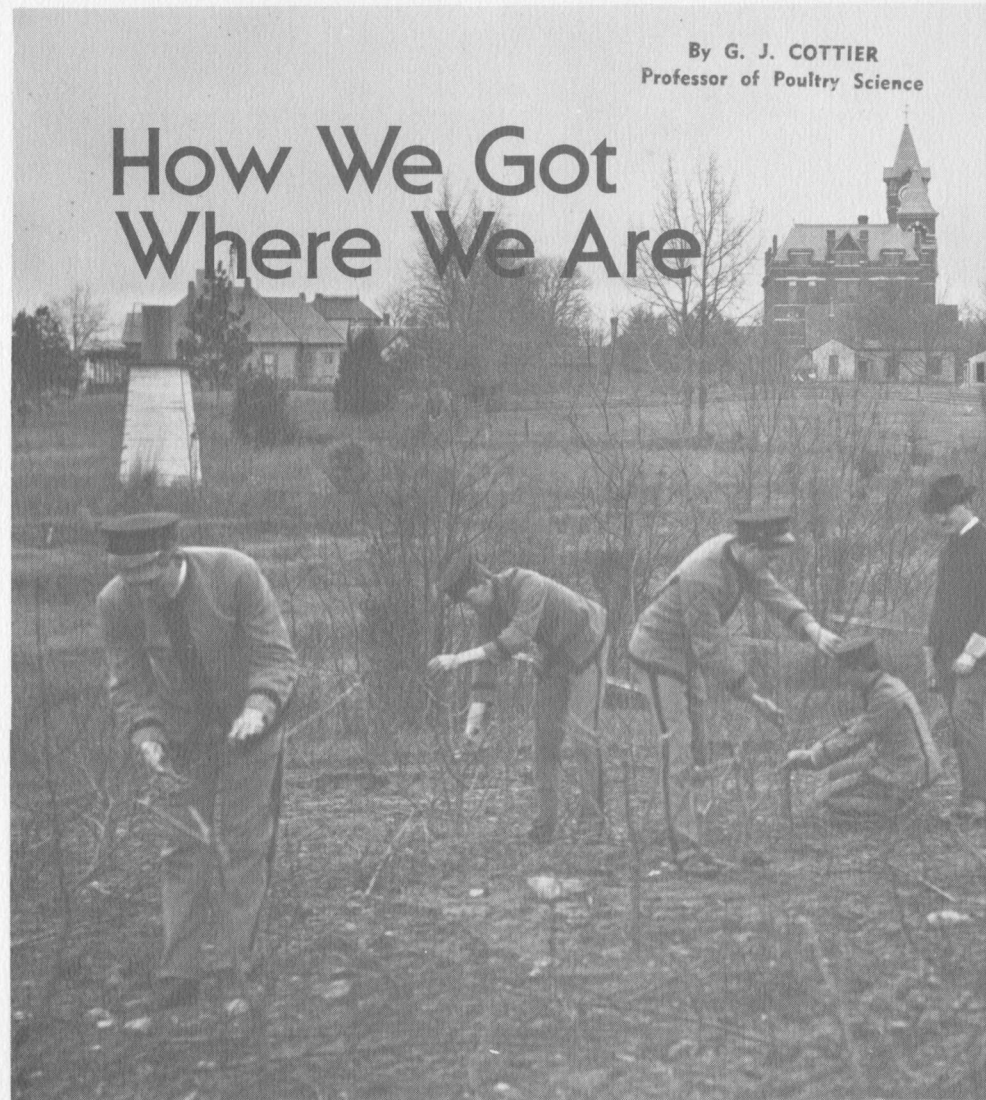
The Experiment Station, 1883-1900

"The bane of our agriculture has been a disposition on the part of investigators in the field of agricultural experimentation to draw conclusions and announce them as facts before they are definitely ascertained. This will be avoided, as far as possible, at this station."

This comment was made by J. S. Newman, the first director of the station in 1883. Newman felt that most farmers did not have the time or money

By G. J. COTTIER
Professor of Poultry Science

How We Got Where We Are



to spend on research. Therefore the new station was to conduct experiments with accuracy and persistency and render the results to farmers.

In the beginning years of the station, Newman acted as director of agriculture and horticulture by conducting experiments with field crops, fruits and vegetables, animal breeding, and fertilizers. He often hand delivered results of research projects to farmers at farm meetings.

George F. Atkinson, who served as biologist from 1889 to 1892 at the station, found that cotton rust was due to a lack of potash in the fertilizer. The Atkinson tomato, developed by the horticulture department and released in 1966, was named for him.

In 1892, Dr. C. A. Cary joined the staff as veterinarian for the college



and experiment station. He was the foremost leader of animal health in the South at that time and assisted many communities in dairy and meat inspection.

J. F. Duggar became a member of the station staff in 1896 as acting agriculturist. He was an early advocate of experimentation in various soil types in Alabama. Duggar started the "Old Rotation" cotton experiments in 1896, which is one of the oldest continuous crop rotation experiments in the South.

P. H. Mell, who was appointed the second director of the station in 1899 began work at Auburn as professor of natural history and later was head of botany and meteorology.

The Experiment Station, 1900-1930

Duggar, as director in 1903, reorganized the station and created several positions. In 1914, he became the first director of the Agricultural Extension Service. Due to his influence, the Alabama Legislature appropriated \$75,000 in 1906 for the construction of Comer Hall, an agricultural building. It was occupied in the fall of 1909, burned in October, 1920, and was rebuilt in 1922.

Farmers' Institute or Farmers' Week, a meeting for farmers was started in 1903 with Dr. Cary as the first director. Lectures were conducted during the meetings detailing progressive experiments. Demonstrations of better farming methods were also given. With the establishment of substations, the interest in Farmers' Week declined and it was discontinued in the early 30's for farmers. It was the forerunner of the short course for veterinarians.

Dan T. Gray was appointed as instructor in animal industry in 1905, was head of the department in 1907, and was station director and dean of agriculture from 1921-1924. Prior to 1921, these two positions were held by four different people.

M. J. Funchess was appointed assistant professor of agriculture in 1909, head of crops and soils in 1920, and served as director of the Experiment Station and dean of agriculture from 1924-1951. He published the first technical bulletin from Auburn in 1916.

Homer B. Tisdale joined the Experiment Station as plant breeder in 1913, and developed the Auburn 56 variety of cotton, which was released in 1956. This variety was recognized as one of the best commercial varieties then available. It had high yields, resistance to fusarium wilt, and tolerance to root-knot nematodes.

The botany department was established in 1909. In 1927, the name was changed to botany and plant pathology and in 1971 it became botany and microbiology.

In 1919, the department of agricultural engineering originated with M. L. Nichols teaching courses in soil conservation and farm machinery. Nichols and his coworkers developed a channel type terrace to aid in controlling soil erosion. It was called "Nichols Terrace."

W. D. Salmon came to Auburn in 1922 as assistant animal husbandman in the department of animal husbandry. His early work was with nutrition of swine. He later transferred his interest to laboratory animals because they could be used to speed up nutrition research. He began the Animal Nutrition Laboratory and was an outstanding leader in nutrition. From 1950 to 1957, Salmon served as head of the Department of Animal Husbandry.

Homer S. Swingle joined the staff in 1929 as associate professor of Entomology. He changed his research interest to fish in 1933 and from this beginning his work was expanded to the world renown Department of Fisheries and Allied Aquacultures and the International Center for Aquaculture.

The Station, 1930-Date

Dr. E. V. Smith was dean of the School of Agriculture and director of the experiment station from 1951 to 1972. Smith began at Auburn as an instructor of botany in 1932 and was appointed assistant dean and director in 1944. He became associate dean and director in 1949. Dr. Smith was active in the securing of up-to-date buildings and facilities as the result of a bond issue in 1957. The buildings, dedicated in 1961, included Funchess

Hall, Animal Sciences Annex, Livestock Arena, Meats Laboratory, McAdory Hall, and Sugg Laboratory.

Dr. R. Dennis Rouse is the present director of the station and dean of the School of Agriculture. He joined the Auburn faculty in 1949 as an assistant professor and soil chemist. Dr. Rouse assumed the position of director of the Agronomy and Soils Testing Laboratory in 1957, and remained in this position until his appointment as associate director of the experiment station and assistant dean of the School of Agriculture in 1966. He became dean and director September 1, 1972.

Many accomplishments have been made since 1930. Today the Alabama Agricultural Experiment Station System consists of the main station at Auburn and 21 outlying units throughout the state, see back page map. Acreage has increased from 226 acres, purchased in 1883, to 22,085 acres in 1976.

A wealth of research has been undertaken at the Agricultural Experiment Station during the past 45 years. The broiler industry began in Alabama in the late 1930's. In the early 1950's a vaccine was developed for the control of coccidia, which can be used to fight this parasitic disease in the egg and broiler industries. In the late 1950's, another vaccine was developed in the Department of Poultry Science for control of the disease fowl cholera.

TABLE I. THE ALABAMA EXPERIMENT STATION SYSTEM

Name	Location	Date authorized	Acreage	
			Original	Present
Main and Substations				
Main	Auburn	1883	226	4,609
E. V. Smith Research Center	Milstead	1973	3,226	3,226
Tennessee Valley	Belle Mina	1927	240	760
Sand Mountain	Crossville	1927	240	536
Black Belt	Marion Junction	1927	1,116	1,116
Wiregrass	Headland	1927	220	532
Gulf Coast	Fairhope	1927	720	800
Upper Coastal Plain	Winfield	1944	735	735
Piedmont	Camp Hill	1945	1,409	1,409
Lower Coastal Plain	Camden	1947	1,790	2,707
North Alabama Horticulture	Cullman	1948	160	160
Chilton Area Horticulture	Clanton	1948	145	161
Experiment Fields				
Tuskegee	Tuskegee	1927	160	237
Prattville	Prattville	1927	40	80
Monroeville	Monroeville	1927	40	79
Brewton	Brewton	1927	60	80
The Canebroke Substation at Uniontown has been discontinued as has Experiment fields at Alexandria, Aliceville, Atmore, Gastonburg, Hackleburg and LaFayette.				
Forestry Units				
Autauga County	Prattville		300	300
Barbour County	Clayton		180	180
Coosa County	Alexander City		160	160
Fayette County	Fayette		1,332	1,332
Miscellaneous				
Plant Breeding Unit	Tallassee	1946	640	664
Thorsby Foundation	Thorsby	1953	180	180
Seed Stocks Farm				
Ornamental Horticulture Field	Spring Hill	1951	7	22

Researchers are presently studying the advisability of using solar energy for the brooding of chicks in poultry houses.

A beef sire evaluation program was established in 1950, which is the oldest in continuous existence. Finishing rations for beef cattle utilizing important feed stuffs have been developed and tested. Parakeratosis of swine was found to be caused by a zinc deficiency. Recent studies have proven that animal waste has significant value as feed for livestock, and that two-stage lagoon is an effective method for handling animal waste.

In the Department of Agronomy and Soils, two types of cotton have been developed. Plains cotton was developed in 1940 and is a high yielding variety of cotton. The Auburn 56 variety of cotton was developed in 1956. It had resistance to fusarium wilt and was used mainly as a breeding material for new varieties of cotton.

Also released in the forties was Auburn Crimson clover, a reseeding variety of clover with high herbage production, arrowleaf clover, and Regal ladino.

Recently, two types of germplasm were developed. L2 vetch germplasm was found to be the source of hard seedcoat, which makes reseeding possible. It also has high herbage and seed yields. Alabama 1894, another type of vetch germplasm, was found to have a source of high-seed production under Alabama conditions.

The Soil Testing Laboratory at Auburn was established in 1953. The laboratory makes fertilization recommendations based on research for over 50 different crops. From 1953 to 1957, the samples taken totaled 44,000. Last year the total of samples taken rose to 63,000. The Soil Testing Laboratory operates jointly with the Agricultural Extension Service.

Today Auburn has the world's largest freshwater fisheries research facility and is recognized worldwide for its contributions to fisheries and aquacultural research.

Research in the past has been very important not only to the people of Alabama, but also to the entire nation and the world. As the centennial in 1983 approaches, many more accomplishments will be achieved.

TABLE II. PRESENT DEPARTMENTS OF THE EXPERIMENT STATION

Department	Original name	Year started	First head
Agricultural Economics and Rural Sociology	Agricultural Economics	1928	J. D. Pope
Agricultural Engineering	Agricultural Engineering	1919	M. L. Nichols
Agronomy & Soils	Crops & Soils	1919	M. J. Funchess
Animal & Dairy Sciences	Animal Industry	1907	Dan T. Gray
Animal Health Research	Animal Disease Research	1950	R. S. Sugg
Botany & Microbiology	Botany	1908	F. E. Lloyd
Fisheries and Allied Aquacultures	Fisheries & Allied Aquacultures	1970	Homer S. Swingle
Forestry	Forestry	1947	R. H. Westveld
Home Economics Research	Home Economics	1950	Ernestine Frazier
Horticulture	Horticulture	1903	R. S. McIntosh
Poultry Science	Poultry Husbandry	1947	D. F. King
Research Information	Publications	1947	K. B. Roy
Research Operations	Research Operations	1974	V. Lavern Brown
Zoology & Entomology	Entomology	1908	W. E. Hinds

Some Highlights of 1975 Research



AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Estate Planning Study

An estate tax planning study indicated that estate plans used by farm owners conserved their estates. However, when the values of the estates studied were updated to reflect current values, the significance of using estate planning tools wisely was apparent. By using a will and a lifetime giving program, a savings in estate taxes of over \$50,000 was possible in one of the farm estate examples studied.

Farm Labor Problem

Finding and retaining good farm labor has been a problem on many Alabama farms. A study of full-time labor on dairy farms in Alabama's Black Belt area indicated that farmers must consider industrial rules in recruiting labor, the gap between farm and non-farm industry wage rates must be narrowed, workers who can accept responsibility should be employed, and adequate worker training is necessary to develop skills required in handling expensive animals, machinery, and equipment.

Cost of Producing Milk

Costs of producing farm products continued to increase in 1975. To provide current cost data to the Alabama Dairy Commission, a study of producing milk on 57 Alabama dairy farms was conducted. Average 1974 cost per hundredweight of milk produced was \$10.63. Average size dairy herd was 116 cows and the average farm size was 336 acres.

Contracting Cotton

Farmers are of necessity turning to contracts and other measures to gain in product marketing. Various kinds of contracts and terms used in marketing cotton were studied recently. It was found that the December futures price for the crop was closely related to the major contract prices. Growers assume considerably more risk and buyers considerably less risk on bale-type than on acreage-type contracts. Therefore, major prices on bale-type contracts should be higher at any given time. According to farmers, forward contracting provides protection against price declines and aids in planning for production. They also believe growers do not share in price increases, and are at a disadvantage in evaluating the cotton market outlook.

Hog Marketing Methods

From research on the price of market hogs in Alabama using prices for 1972 and 1973, it was found that differences in weights of hogs were not significant when they were sold at different markets in the State. There appeared to be no price advantages from selling by telephone bids, telephone auction sales, or traditional auction selling. Prices of hogs on Alabama markets generally were competitive when compared with prices for National Stockyards, St. Louis, except during times of erratic pricing.

Waste Disposal

A regional plan for solid waste disposal in five Northwest Alabama counties showed a possible annual saving of \$118,000 compared to the use of sanitary landfills in each county.

Problems involved in recruiting and keeping qualified laborers to operate the complicated machines used on Alabama farms got detailed study.



Weeds that overtop peanuts at harvest (left) were found to be those that emerge during the first 6 weeks after planting. Thus, early season weed control is essential for this crop. Remote controlled tractor guidance systems being researched at Auburn (right) may lead to precise operation that is superior to human operator accuracy.

AGRICULTURAL ENGINEERING

Agricultural Engineers Heat the Birds

Presently fossil fuels are the primary source of energy used to supply heat energy to brood baby chicks, poults, and ducklings. Agricultural engineers are researching a way to keep the birds warm and save fossil fuel too.

A solar energy research team at Auburn University initiated a study in 1974 to determine the feasibility of adapting solar energy to poultry production programs. Since poultry requires a large amount of heat energy to efficiently convert feed grains to animal protein, the future supply and costs of this important meat commodity depend upon a constant, economical source of energy.

A solar heated poultry house, similar to buildings used in the commercial poultry industry, is currently under construction. The equipment will be commercially available, "off-the-shelf," and the results should be readily adaptable to commercial production units.

Similar studies are directed toward the use of solar energy to provide energy for brooding pigs in a modern farrowing house. A 14-sow farrowing house has been completed and the solar heating system is now being installed.

Let The Tractor Do It

Live horses of today have gone to greener pastures where they may wistfully watch their mechanical "horse" successors flex their muscles to tasks larger than the wildest imaginations. Yet, despite these changes, man still holds the reins to guide his beast of burden. The controls are no longer simply "gee" or "haw." The speed is much faster, equipment is much larger, and the tractors are extremely complex. In brief, man's job is mentally, at least, much tougher. The best operator can control a tractor only within an accuracy of about 6 inches; therefore, a computerized digital control system is undergoing experimental tests by agricultural engineers at Auburn. Previously, researched analog guidance systems designed to track on electrically charged underground wires were modified to incorporate digital control concepts, and elicited tracking accuracies of about 1 inch at surface speed of 1 to 12 miles per hour.

AGRONOMY AND SOILS

Weed Competition

Recent studies in the Department of Agronomy and Soils show that peanuts are highly competitive with sicklepod and Florida beggarweed. Herbicides and various cultural practices used wisely enable the peanut to favorably compete with weed infestation.

Peanut yields are not reduced when peanuts are maintained free of sicklepod and Florida beggarweed for as much as 4 weeks after emergence of the crop. If the grower can successfully control weeds for this period and maintain vigorous crop growth for the remainder of the season, peanuts can effectively suppress weeds that germinate after this period. Weeds compete with peanuts for more than 10 weeks after emergence of the crop before yields are reduced. Weeds that overtop peanuts at harvest emerge during the first 6 weeks after planting.



Continuing efforts to further improve animal productivity through crossbreeding is evidenced by the wide variation in appearance of beef research herds.

A Highly Palatable and More Nutritious Sericea in the Making

Experiment station scientists in the Departments of Agronomy and Soils and Animal and Dairy Sciences are developing a new sericea that is highly palatable to cattle, and tests show that dry matter and crude protein of this low-tannin sericea are more highly digestible than in normal or high-tannin sericea. Research shows that low-tannin sericea plants are 12 percent higher in digestible dry matter (DDM) than high-tannin plants as indicated by the *in vivo* nylon bag method.

Using grazing steers and the Cr_2O_3 -chromogens technique, DDM was also found to be higher for low-tannin forage than for high-tannin. This was substantiated by a lower crude protein percentage of feces from cattle on low-tannin forage than from cattle on high-tannin sericea. Feces from cattle on high-tannin sericea contained 22 percent more crude protein than did that from cattle on low-tannin forage. Also, feces from steers on low-tannin forage was higher in percent *in vitro* digestibility than that from steers on high-tannin forage.

In this grazing study, crude protein was higher than 16 percent during three 28-day grazing periods from May through mid-September. These findings indicate that low-tannin sericea varieties are not only more nutritious, but that cattle graze them with enthusiasm.

Nematode Resistant Forage Grasses

The sandy soils of the Southeast are infested with many different types of nematodes. Several species damage the roots of cool season pasture plants leaving them susceptible to drought and frequently resulting in severe

stand losses. Research in the Agricultural Experiment Station at Auburn has shown that nematodes will cause over 50 percent reduction in tall fescue production. Nematode resistant tall fescue and phalaris varieties being developed at Auburn will improve stand persistence as well as forage yield. An even more exciting prospect is that, with added nematode resistance, these cool season grasses will produce much needed winter forage on many of the sandy soils of the Southeast where nematode susceptible varieties cannot be grown. The possibility for expanded acreage as well as improved yield will mean more winter forage for Alabama beef herds.

Irrigation and Fertilization for Commercial Tomatoes

Research has shown that a medium irrigation level combined with 60 to 120 pounds of nitrogen fertilizer produced the best yields of tomatoes. Very high rates of nitrogen did not give additional yield increases and resulted in a trend toward a lower percentage of large tomatoes and a higher percentage of small tomatoes. On soils testing low to medium in phosphorus, yields were generally increased about 20 to 30 percent by fertilizer phosphorus. Fertilizer potassium increased yields about 10 to 20 percent on soil with low to medium soil-test potassium.

ANIMAL AND DAIRY SCIENCES

Grazing Program Studied

Efficiency of land utilization and maximized production through a double-cropping system were the goals of a soybean-cool season grazing crop test. Yields of 30 bushels of soybeans and beef gains of 350 pounds and more per acre have been obtained. Feeder steers developed on this program finish to desirable slaughter weight and grade on a short-term finishing regime requiring modest amounts of feed grain.

Carcasses From Animals on Grazing

Good quality beef calves grazed for the full season on high quality cool season crops such as rye, ryegrass, and clover obtained Good and Choice slaughter finish with little or no supplemental feed. A study of meat quality attributes (flavor, tenderness, color) of beef from cattle finished on the above program and beef from grain finished cattle revealed no significant differences in meat quality factors within carcass grades.

Sawdust Good Energy Source

Although still in the developmental stages, preliminary data from animal scientists at Auburn reveal that subjecting sawdust to chemical treatment can unlock the cellulose and hemicellulose components to serve as valuable energy substrates for rumen microorganisms. Using this process, oak sawdust has proved to have a digestible energy value comparable to good quality grass hay.

Potential Growth Rate Studied

Animal scientists have devoted considerable effort in a search for an accurate indicator of potential growth rate. Auburn data are preliminary but do indicate that plasma protein, certain enzymes, and cell number obtained early in life may be valuable predictors of yearling liveweight of beef cattle. Such measures of growth potential would be invaluable in selecting future breeding stock and would have significant effects on selection programs.



Crossbred Calves and Pigs Best

Additional data support the practice of crossbreeding in beef cattle and swine, especially the use of crossbred dams. Most recent data show an 18 percent increase in average weaning weight of calves from crossbred cows compared to calves from straightbred cows of the British breeds. Comparable differences in performance are obtained in swine research.

Confined Swine Production

Confinement swine production was studied in an effort to reduce labor requirements and therefore increase pork produced per unit of labor. In many respects this did occur since mechanization became possible in feed and waste handling. Research indicates reproductive problems occur in confinement production as evidenced by a lower conception rate, reduced birth weights, smaller litter numbers, and lowered livability of pigs.

ANIMAL HEALTH RESEARCH

Missing A Meal Can Be Fatal for Baby Pigs

Animal health research is underway at Auburn to determine factors causing swine agalactia, a disease which causes little or no milk to be produced by the sow.

The condition can be fatal in the newborn pig because it has a very small amount of stored energy. Unless the newborn pig nurses, high death losses will occur from low blood sugar. The dangers of swine agalactia are increased during cold weather when the pig requires more nutrients to maintain body temperatures.



LEFT: Barley yellow dwarf, a disease recently found in central and northern Alabama plantings of wheat and oats, is being investigated at Auburn. **TOP:** Swine agalactia, a sow disease that deprives young pigs of milk that is essential to their survival, is the subject of an Auburn animal health project.

One major cause of the disease is mastitis or infection of the udder. Studies have shown that these infections are common in sows at the time of farrowing.

When Cattle Should Be Treated For Parasites

A study on the activity of intestinal enzymes of calves is being conducted to determine if the activity of enzymes produced by the lining of the intestines can be used to tell when cattle should be treated for parasites. This test is being used to determine if there is a better method of diagnosing parasitism in cattle.

Constant Struggle Goes on Against Germs

Calves are being given various kinds of viruses to determine how defense mechanisms cope with viruses. Research is being conducted at Auburn to find out what type of viruses cause respiratory diseases (shipping fever).

New Treatment for Impotence in the Bull

From basic research on reproduction in domestic animals, a procedure was developed by Auburn researchers to aid in the diagnosis of one type of breeding failure in bulls. Injury to the male reproductive organs often results in impotence due to interference with vascular blood flow. The site of vascular interruptions is located, the vessels are then ligated or tied, and blood pressure is restored. Bulls that previously would have been slaughtered can, in many cases, be returned to service.

BOTANY AND MICROBIOLOGY

Microbiologists Test Barley Virus

A disease, barley yellow dwarf (BYD), has been identified recently in some wheat and oat plantings in central and northern Alabama. Representative samples were forwarded to scientists at Cornell University for assay by aphid transmission. Barley yellow dwarf virus was isolated from three oat samples and three of seven wheat samples, thereby establishing occurrence of the virus in Alabama for the first time. Research has been initiated to evaluate systemic insecticides for control of BYD.

Cause of Auburn Water Odor Found

The principal odor-causing factor, which has plagued the Auburn water supply each spring for the past 10 years, has been confirmed as geosmin, a common odor-causing compound in water supplies throughout the country. Strong evidence indicates that actinomycetes are the causal biological agents. This is supported by the fact that over 98 percent of these organisms isolated from the water source produce geosmin and another odorous compound identified as 2-methylisoborneol.

Big Savings Seen for Bama Peanuts

One of the more important successes this year was the determination that significant germination losses of seed peanuts occur if they are not treated near the time of shelling. Last year, more than 8 million pounds of peanut seed were planted in Alabama. Most of them were treated long after shelling. Tests indicate a 10 percent loss in germination is not unusual. Prompt treatment after shelling would allow seeding rates to be cut 10 percent, thereby saving \$500,000 in Alabama alone.

Another test indicates wet-milling of the fungicide Bravo can reduce rates of application by one-third. Based on 2 years' data developed by Auburn, registration of the lower rate and plant retooling are underway. Since 60 percent of Alabama's peanuts were sprayed with Bravo five to six times last season, savings of \$1.2 million can be expected from this finding in Alabama alone, which has 12 percent of the U.S. market.

White Mold Control Developed

A major breakthrough has been the development of white mold control through research. Trial recommendations of "experimental" labelled products (7,000 acres treated in Alabama) showed that combinations of PCNB and contact nematicides result in control of the white mold nematode complex. Returns of 10:1 over cost were common in experimental fields. Indications are that one of these products, Vitavax, will be labelled soon for white mold control. This product has a high probability of even more effective control at 50 percent of the cost of PCNB.

FISHERIES AND ALLIED AQUACULTURES

Waste Fish-Fish Waste Tested

Buffalofish, tilapia, and Chinese carp grow well in combination with catfish, but they do not at present have good market value when processed conventionally. Flesh from these species was separated from bones and scales by a mechanical deboner. It yielded minced flesh with good texture, light color, bland flavor, and was essentially free of bones and scales. The minced flesh was made into a variety of products such as fish cakes, filled shrimp, and crab products rating high in consumer appeal.

Catfish processing waste amounting to 40 percent of the total weight of the fish currently has no economical use in industry. Technology has been developed to make dry and moist swine feeds, pelleted catfish feed, and canned dog foods from the catfish waste. These products have high acceptability and nutritive value in animal feeding tests, and appear to be economically feasible products for commercial production.

Life-Change Seen for New Lake Fish

The impounding of the Chattahoochee River to form West Point Reservoir offered an excellent opportunity for sport fish researchers at Auburn to

document the changes that take place in expanding fish populations. The 1975 year class (hatched in 1975) of bass was routinely sampled throughout the year. Those bass spawned early were large enough to effectively use the large year classes of threadfin and gizzard shad as forage. These fish grew rapidly and were able to continue to feed on shad throughout the year. As a result, they now range in size from 10 to 14 inches and weigh more than a pound. However, that portion of the bass population spawned later was not able to feed heavily on shad. These fish ranged in size from 4 to 9 inches in October-November and were in relatively poor condition. Those small bass that survive through the winter should grow rapidly after the forage species spawn in 1976.

Fish Farming Shows Yield Increase

Polyculture experiments, with channel catfish as the principal species, showed that a large production potential exists in the form of excess nutrients in conventional fish farming operations. Feed and fertilizer inputs were constant, and yields were measured for ponds with catfish and compared with those where other species such as tilapia and silver carp were added to feed on plankton, detritus, and waste feed. Yield in polyculture ponds reached 4,500 pounds per acre, compared to 3,100 for channel catfish. This represents a 45 percent increase in yield from previously nonutilized nutrients.

Catfish Dietary Needs Found

The amount of ascorbic acid necessary to prevent the "broken back syndrome" in cultured channel catfish was determined to be 30 milligrams per kilogram of diet. Symptoms of ascorbic acid deficiency in channel catfish include deformed spinal column, clubbed gills, depigmented skin, distorted gill opercula, eroded caudal fin, reduced level of ascorbic acid in liver and anterior kidney, reduced hydroxyproline in bone matrix, and lesions in several internal organs.

Intestinal synthesis of some vitamins apparently occurs in channel catfish. Evidence of this is that catfish fed a biotin-free diet grew almost as well as fish fed diets containing biotin. Catfish must receive biotin for their metabolic needs from either the diet or intestinal microorganisms.

FORESTRY

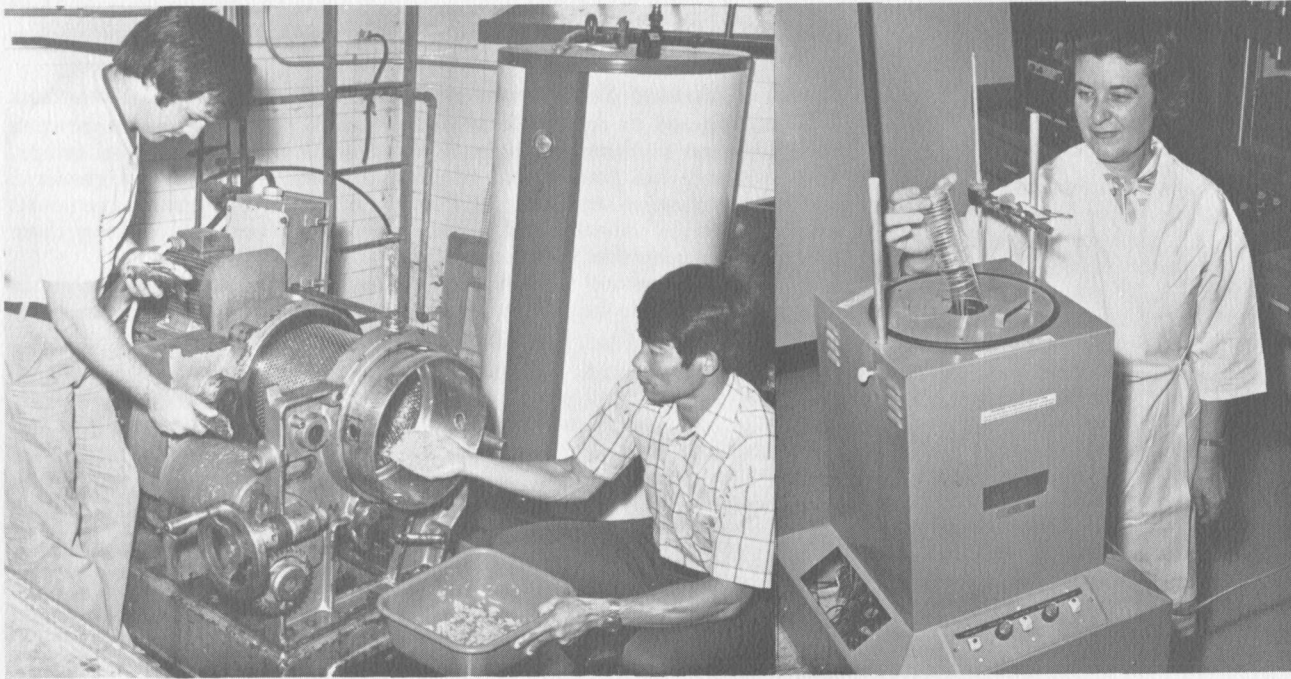
Foresters Test Pine, Hardwood, and Christmas Tree Growth

Foresters conducting field tests in the Upper Coastal Plain of Alabama with loblolly pine, sweetgum, yellow poplar, and sycamore have found that fertilizer increases the growth of these hardwoods, but not the growth of pine, and that mortality seems to be related to an increase in the rate of application. Maximum height growth of all species occurred on the lower slopes where soil moisture was highest.

Arizona cypress, when planted for Christmas tree production, requires weed control, fertilization, and pruning of the trees. Weeds can be controlled in Lower Coastal Plain locations by spraying with Simazine, but two treatments within the growing season are necessary for good control.

Map Shows Forest Vegetations

Auburn foresters were instrumental in developing the first composite map of any Southern State showing vegetational provinces superimposed on satellite photography for Mississippi and Alabama. The imagery and type differentiation is at a scale that permits both state maps to appear on one



sheet of paper. A key to all vegetational types appears on the reverse side of the map. Satellite coverage of Mississippi revealed some vegetation never described. Field checks reveal that this type is identifiable on the ground.

HOME ECONOMICS RESEARCH

Nutritional Status of Pre-Teen Girls

The eating habits and nutritional status of 94 pre-teen girls (50 black and 44 white) are being studied over a 3-year period. During this second year of the study, black girls tended to be both taller and heavier than white. Their blood serum cholesterol values averaged 21 percent higher than those for white girls, but the latter tended to have higher triglyceride and hemoglobin levels than the blacks. The higher serum cholesterol levels for black girls might be an early indicator of potential circulatory problems in adulthood.

Color Changes Recognized by Panel

A consumer panel identified color changes such as yellowing or graying in white fabrics more accurately than they did color losses from dyed fabrics when asked to rate degree of color change. Color losses from pastel shades of blue and yellow were perceived less accurately than were those from the darker shades of the same colors. The color changes in the pink and red fabrics were readily identified by most panel members.

Effects of Radiation on Yarn Durability

Effects of light that reaches the earth's surface were studied on two types of yarn by researchers in an attempt to see if the yarns were affected by the

Flesh from waste fish, separated from bones with mechanical deboner (above left), was used to produce fish cakes and other products that rated high in consumer appeal. Certain types of yarns were found to deteriorate when exposed to ultra-violet radiation in Auburn laboratories (above), while other yarns showed good resistance to damage. Forestry researchers found that fertilization increased growth of sweetgum, yellow poplar, and sycamore, but there was no growth improvement by loblolly pine in the test conducted in Alabama's Upper Coastal Plain Region.



light. The two yarns, commercially available under the trade names Nomex and Kevlar, were shown to have deteriorating fibers when exposed to the light. These two yarns have superior strength. A third yarn, Qiana, was also exposed to ultra-violet radiation and tests showed that it had good resistance to the light.

Salts Affect Fabric Flammability

Results of flammability tests have shown that effects of sodium, calcium, and magnesium salts on fabric flammability are erratic, some (e.g. sodium carbonate) causing greater flammability while others, such as magnesium chloride, cause the fabrics to be less flammable. Pyrolysis studies indicate that the products of pyrolysis do change with changes in behavior of the vertical test. Those salts which render the fabric less flammable suppress the generation of methane and ethylene, two of the easily identifiable flammable gases. Lower values on the oxygen index tests also correlate with the identification of increasing amounts of hydrocarbon volatiles.

Causes of Depressed Appetite and Growth

Home economics researchers at Auburn are striving to determine the cause of depressed appetite and growth that result from feeding laboratory animals a ration of either a single inferior protein or one extremely high in protein. Tests show that either type of diet elevates blood ammonia and in some instances blood glucose. A better understanding of this basic regulatory mechanism could lead to more efficient utilization of plant proteins for domestic animal feeds, help prevent adverse effects that often occur when high protein diets are fed to children suffering from protein calorie malnutrition, and help in the treatment of chronic liver diseases.

HORTICULTURE

Summer Pruning of Apples

Research conducted by Auburn University Agricultural Experiment Station during the 1974 and 1975 seasons showed that fruit spur development can be induced on current growth by summer pruning. Under normal conditions, young apple trees do not form fruit spurs on current growth. Therefore, fruit is not produced on an apple shoot until it is in the third growing season.

The current growth was pruned back to two to three buds during the summer on 5-year Top Red Delicious apple trees on M26 rootstock. Most of the buds that were left developed into fruit spurs if pruning was done from July 18 until August 1. Pruning done at earlier or later dates resulted in vegetative growth without fruit spur development occurring. Trees pruned July 18 and August 1 in 1974 produced 50.0 and 44.0 pounds per tree, respectively. In 1975, trees pruned produced 32.7 pounds per tree. The increased light penetration to the fruit surface due to removal of foliage by summer pruning has also resulted in earlier and greater red color development by the fruit.

New Plum for Home and Roadside Markets

A new excellent quality plum variety, Homeside, has been developed and released specifically for home and roadside market use. Homeside has consistently produced good yields of high quality fruit in central and south Alabama; it is adapted where chilling of 700 hours below 45° F occurs. Homeside compares favorably with varieties currently grown in home and

roadside plantings and is more resistant to bacterial fruit spot, bacterial leaf spot, and bacterial canker. It should fill the need for a midseason variety for home and local market for southern Alabama.

Insect Resistant Southernpeas May Lack Chemical Attractant

When exposed to equal infestations of insect pests, mainly the cowpea curculio, some southernpea varieties suffer much less damage than others. This resistance has been shown to result in part from a lack of chemical feeding stimulant or attractant. In bioassay tests, the chemical was removed from susceptible varieties and added to resistant varieties, making them much more susceptible to the curculios.

This understanding of the chemical nature of curculio resistance in southernpeas will be helpful in breeding varieties resistant to the insect.

A Rapid Spot Test for Vitamin C

Testing for vitamin C (ascorbic acid) has traditionally been a laboratory procedure requiring specialized equipment and skilled technicians. A new paper spot test procedure has been developed in Auburn's Horticulture Department that has reduced the time, effort, and skill involved in testing for acidity with litmus paper. The method has been successfully applied to the estimation of vitamin C in the juice from vine ripened tomato fruit.

BELOW: Heavy fruiting of this young apple tree indicates fruit spur development that was initiated by experimental summer pruning. **RIGHT:** Accelerated broiler growth resulted from restricted feeding, which was accomplished in tests by automatic system using time clocks and motors to raise feeders (left) and then lower them (right) for specified feeding period. **FAR RIGHT:** Electronic debeaker developed at Auburn, soon to be available commercially, speeds up the debeaking process, reduces chick trauma, and is less fatiguing on the operator.

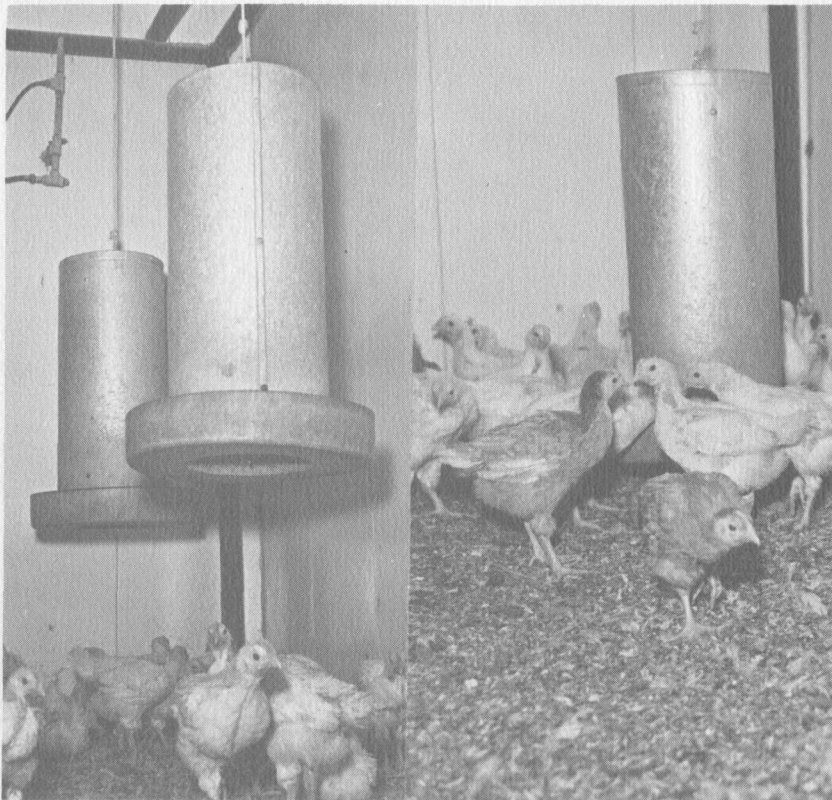


Shaping up Ornamentals with Chemicals

Chemical manipulation of plant growth is providing the consumer with new and more desirable ornamental plants. Chemicals are also saving ornamental plant growers valuable time and labor. The Agricultural Experiment Station has been screening many different types of chemicals. Growth retardants that reduce stem length have been used to tailor the size of chrysanthemum, Easter lily, poinsettia, and other flowering plants to home surroundings. A tropical vine has been turned into a "new" upright house plant by applications of growth retardants. Plant growth substances called cytokinins that cause cell division have been employed to increase the number of shoots (and hence flowers) on garden chrysanthemums. Ethylene-generating compounds have been utilized to produce short poinsettias, remove unwanted flowers in Easter lily bulb production, and to stimulate the rooting of cuttings. Chemical plant assassins have been used to selectively destroy the terminal apex and induce branching in azaleas and other woody ornamentals. An experimental inhibitor has successfully induced branching in azaleas and cleyera without killing the terminal apex.

Instant Jelly Concentrate for Home Processing

The Horticulture Department has been developing and testing frozen instant jelly concentrates suitable for processing standard quality jellies in the home. Formulas for apple, orange, concord grape, and muscadine grape have been developed. They are designed to yield 4.25 pounds of standard jelly from 12 fluid ounces of the concentrate when combined with 2 cups of water and 5½ cups of sugar. Jelly is finished by mixing sugar and water, heating, boiling one minute, adding concentrate and pouring. Total time required is 16 minutes.



POULTRY SCIENCE

Poultry Disease Control

Even though a high percentage of chickens are vaccinated against Newcastle disease, the occurrence of several outbreaks of a more virulent strain on the West Coast has caused concern in the Southeast. Poultry researchers tested samples from many commercial flocks which indicated that adequate protection can be afforded against the more severe type with currently marketed vaccines provided the products are not weakened and are applied properly.

A sample taken from flocks of more than 100 farms indicated widespread distribution of infectious bursal disease (IBD) in Alabama. The virus agent of IBD was widespread throughout the broiler areas with more than 75 percent of the flocks having been exposed prior to 6 weeks of age.

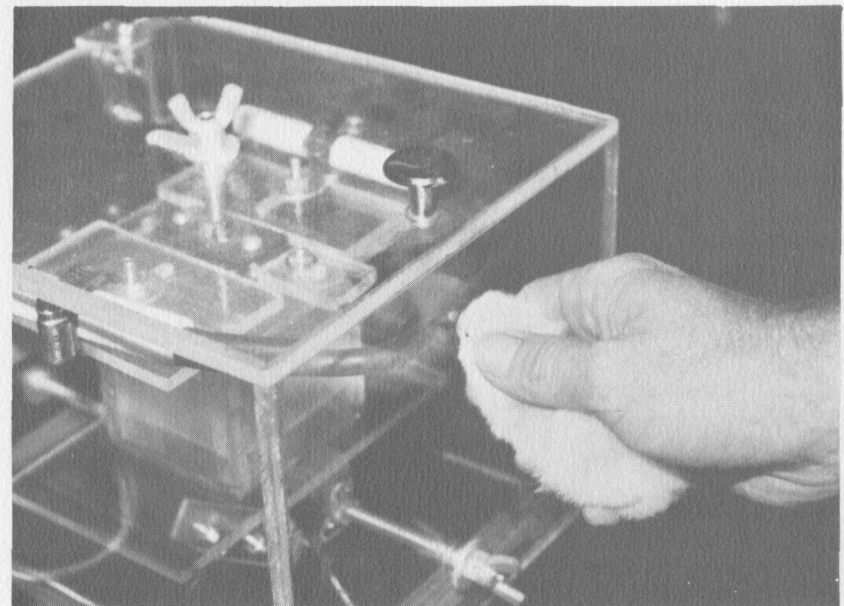
The difference in effectiveness of commercially available drugs against field isolate and laboratory strains of coccidia lend evidence to this concern. Also, the possibility of genetic changes taking place, which make pathogens more dangerous, is now of considerable concern.

There is evidence from research at Auburn that evolutionary changes among coccidia have taken place. This is supported by the occurrences of changes found in life cycles and pathogenicity of different strains of the two most important species studied.

Tumor control tests have shown that extract from a wild fungi inhibited cancer cell growth in cell cultures from animal and human cell lines. Normal non-malignant cells were not as sensitive to the material. After purification and identification, animal trials will be conducted to determine the potential of this material as a cancer inhibitor.

Electronic Beak Remover

The Auburn Research Foundation has applied for a patent on an electronic beak remover designed and tested this past year in the Poultry Science Department. This is the first advancement in beak removal in many years and has the advantage of minimizing trauma and reducing variability that occurs under present methods. This new device, which will soon be available commercially, should be much faster and less fatiguing to the operator.



Feed and Light Relationships for Broilers

Results obtained from intermittent lighting and/or restricted feeding programs developed for broilers are being used in many parts of the United States. The use of intermittent lighting results in an additional growth rate compared with continuous lighting and gives up to 0.10 pound better feed conversion. Restricted feeding accomplished by mechanically removing the feed has also resulted in up to 0.10 pound better feed conversion, however, no additional growth rate was observed. This 0.10-pound saving in feed could result in as much as 2.5 cents per bird in broiler production costs.

ZOOLOGY-ENTOMOLOGY

War on Bugs

Commercial and laboratory preparations of viruses and bacteria were tested by entomologists against insect defoliators of vegetables, soybeans, cotton, and forest trees. Results indicate that these agents were effective in controlling such pests as cabbage loopers, tent caterpillars, and podworms. However, their action was not as rapid as control with conventional poisons. Thus, the biological control agent had to be applied earlier in an outbreak. Several state recommendations and federal pesticide registrations have been supported by this research.

Just Looking for a Home

When the boll weevil invaded the United States about the turn of the century, it moved like a tidal wave from one end of the Cotton Belt to the other. All early efforts were directed toward control of the pest, and only recently have scientists been able to answer some basic questions concerning its ecology.

Movements of this species were monitored by using a series of pheromone-baited traps located up to 20 miles from isolated cotton fields. The catch data from the traps indicated four significant periods of boll weevil movements: (1) short range movement in winter in response to stalk destruction, (2) short range movement in spring and early summer from overwintering areas to cotton, (3) long range migrations during August and September, and (4) short range movement in fall to overwintering quarters.

Shoo Fly

A 15-year program of research on horse and deer flies was concluded in the past year with research on how these pests find a host. Results indicate that both chemical and visual stimuli are involved in host finding. The chemical stimulus used in researching is CO₂. Various parts of the horse fly body were tested electrophysiologically for a response to CO₂. Only the antennal and tarsal segments responded positively. These parts were viewed under a scanning electron microscope to determine the possible types of sensors and their locations.

Pesky Beetle Stymied

The southern pine beetle has caused great timber losses in Alabama for several years. Research has revealed that many infestations declined or completely disintegrated without apparent cause. The collapse or decline of such an infestation near Auburn was apparently due to host resistance factors. Trees heavily attacked by beetles as overwintering sites in the fall of 1974 failed to yield beetle brood in the spring of 1975, and the trees were

still alive when cut in May. Examination of over 1,600 attacks revealed that attacks were unsuccessful with beetles failing to establish galleries or adults were "pitched out" in the galleries. Most galleries were completely filled with hardened resin and many contained dead beetles. The average length of a gallery was only 2.6 centimeters.

The American Woodcock, the Forgotten Bird

The American woodcock has long been a game bird of some repute in certain sections of the northern United States. However, only an occasional bird of this species has been harvested in Alabama, and most of these were shot more by accident than by design. Research reveals that a valuable game resource may have been overlooked in the past. Large numbers of this migratory bird overwinter in Alabama. They nest here in early spring (February and March) and raise one brood before migrating north for the summer. Further research will provide the necessary information for setting seasons, bag limits, and managing this resource.

Pheromone-baited traps were used by boll weevil researchers to determine both short and long range movement of weevils during different seasons of the year.



← Projects Underway In 1975 →

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Full-Time Hired Farm Labor Situation
Dairy Production Costs
Stack and Bale Systems for Hay Handling and Feeding
Crop, Livestock, and Poultry Management
Evaluation of the Beef Production Industry in the South
Economic Position of Selected Alabama Agricultural Enterprises
Evaluation of Phalaris and Phalaris Ladino Clover Pastures for Dairy Cattle
Utilization of Solar Energy in Poultry Production
Conserving and Feeding Crop Residues
Beef Production on Selected Forage Systems
Financial Management and Farm Growth
Evaluation of Irrigation Potential for Alabama
Changing Role of Selected Agricultural Credit Agencies
Resource Use and Planning
Estate Planning for Farmers
Leasing Arrangements in The Tennessee Valley
Economic Evaluation of Outdoor Recreation Facilities
Effects of Investments in Recreational Resources on Income and Employment in Barbour and Marshall counties
An Economic Analysis of Variations in Rural Land Value
Efficient Vehicle Routing and Scheduling for Agribusiness Firms and Public Services
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Short-run and Long-run demand for Broiler Meat
Alternative Forms of Vertical Coordination in Livestock Industry
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Contract Marketing of Cotton
Processing and Marketing Catfish
Marketing Performance of Selected Milk Pricing Systems for Southern Region
Market Organization, Power, and Policies and Programs in the Dairy Industry
Rural Development
Human Resource Potentials and Mobility of Rural Youth
Rural Development and the Quality of Life in the Rural South
Public Services and Economic Development in Rural Communities
Post Project Evaluation of Cheaha Creek Watershed Development
Solid Waste Management for Northwest Alabama
Preparation of Forestry Management, Fire Protection, and Fish and Wildlife Management Plans for West Point Lake, Chattahoochee River, Alabama and Georgia
Continuance Planning in Outdoor Recreation
Aquaculture and Inland Fisheries
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Engineering Systems for Cotton Production
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Influence of Cultural Practices on Short-Season Cotton
Correction of Subsoil Acidity in Cotton Production on Coastal Plain Soils
Poultry Production
Responses of Chickens to Variations in Air Temperature, Humidity, and Velocity
Reproductive Performance of Artificially Inseminated Broiler Breeders Maintained in Cages
Selected Environmental Factors on Feathering, Skin Lesions, and Growth of Broilers

Utilization of Solar Energy in Poultry Production

Conservation

Tile-Outlet Terraces for Erosion Control in the Southeast

Irrigation

Evaluation of Irrigation Potential for Alabama

Farm Machinery

Determining Farm Machinery Capacities

Automatic Direct Digital Control for Steering Tractors

Stack and Bale Systems for Hay Handling and Feeding

Fisheries

Aeration Effect on Water Quality and Catfish Production

Waste Control

Animal Waste Treatment and Recycling Systems

Evaluation of Wastewater Reuse Lagoon Systems

Conserving and Feeding Crop Residues

Process for Making Animal Feed from Waste from Cattle in Production Units

Nut Culture

Factors Influencing Vegetative and Reproductive Development of Young Pecan

Trees with Trickle Irrigation

Soybean Production

Herbicide-Tillage Interactions on Soybean and Soil in Monoculture System

AGRONOMY AND SOILS

Soil Chemistry and Soil Fertility

Nitrate Movement in Soil Profiles

Effects of Soil Acidity and Calcium on Soil Solutions and Yield of Crops

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Ion Exchange and Stability Characteristics of Soil Clay Minerals

Factors Affecting Vertical Movement of Nitrates

Soil Testing and Plant Analysis

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Soil Classification

Taxonomic and Interpretive Classification of Alabama Soils

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Chemical Profile and Nutritive Value of Forage Genotypes

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New Plant Introduction, Multiplication, Evaluation, Preservation

Productivity and Quality of Phalaris, Annual Cool Season Grasses, and Legumes

Plant Breeding

Genetics, Breeding and Evaluation of Sericea and Vetch

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Breeding White Clover for Persistence and Yield

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Influence of Cultural Practices on Short-Season Cotton

Evaluation of Cotton Varieties and Strains

Weed Control

Economic Thresholds of Weed Populations in Cotton

Chemical and Biological Weed Control in Agronomic Crops

Cultural and Environmental Effects on Herbicide Persistence

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Soybean Variety and Experimental Strain Evaluation

Cropping Systems and Moisture and Fertility for Soybeans

Alleviations of Soybean Root Restriction by use of Deep-Rooted Grass

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Grain Crops Variety and Experimental Strains Testing

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Evaluation of Phalaris and Phalaris Ladino Clover Pastures for Dairy Cattle

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Fertilizers and Organic Wastes Applied to Soils
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Beef Production

Beef Production on Selected Forage Systems

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Legume Protein, Preparation, Evaluation, and Amino Acid Composition and Metabolism

Vitamin E for Swine Research in Confinement

Chemical Profile and Nutritive Value of Forage Genotypes

Livestock Waste as Animal Feed

Use of Cellulase to Improve Ruminant Digestion of Cellulose

Energy and Protein Levels in Blended Dairy Rations

Effect of Dietary Cholesterol on Longevity in Rats and Factors Affecting Milk Cholesterol in Cattle

Relationship of Nucleic Acid and Polyribosome Contents to Growth of Muscle of Beef Cattle

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Growing and Finishing Stocker Cattle in the Gulf Coast Area

Growing-Finishing Systems for Beef Steers in North Alabama

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Growing-Finishing Systems for Steers in the Coastal Plains

Selection at Two Weights and Its Effects on Efficiency of Swine Production

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The Kinetics of Bacterial Thymidylate Synthetase and its Inhibition by Substrate Analogs

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Effects of Breed and Breed Crosses on Milk Production and Other Factors in a Grade Beef Herd

Selected Reproductive Phenomena in Cattle and Swine

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Comparison of Urea and Soybean Meal in a Silage-based Complete Feed for Dairy Cows

Evaluation of Floor and Bedding Materials in Freestalls for Dairy Cows

Evaluation of Phalaris and Phalaris Ladino Clover Pastures for Dairy Cattle

Waste Management

Animal Waste Treatment and Recycling Systems

Lagoon Waste Management and Recycling Systems for Confined Dairy Cattle

Evaluation of Wastewater Reuse Lagoon Systems

Processes for Making Animal Food from Waste from Cattle in Production Units
Conserving and Feeding Crop Residues

Meat

Effect of Preslaughter Immobilization on Pork Quality

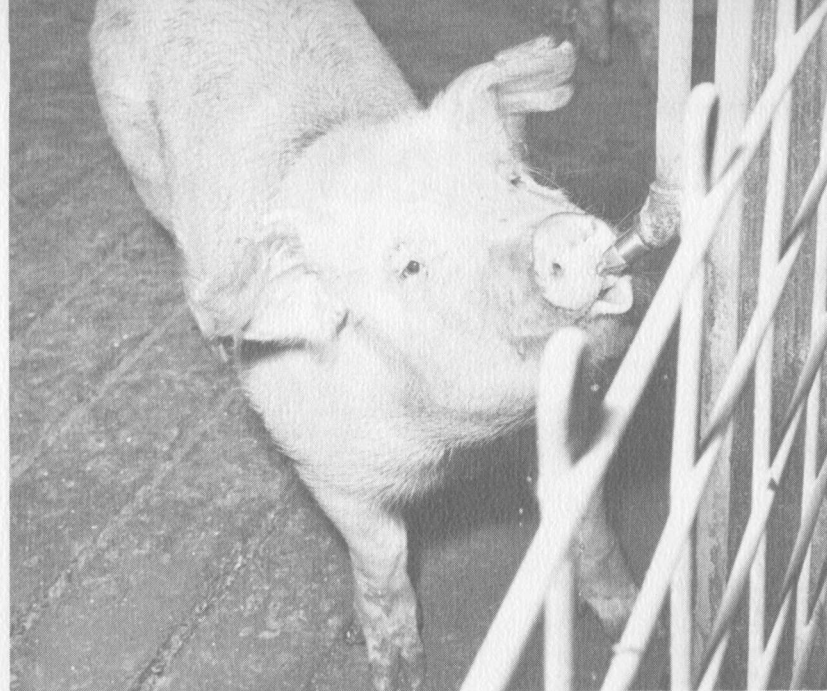
Livestock Waste as Animal Feed

Factors Responsible for Tenderness Variation in Meat

Beef Production

Breeding Methods for Beef Cattle in the Southern Region

Beef Production on Selected Forage Systems



Drinking fountain provides clean water for swine in new Experiment Station facility.

Forage Production

Relationship Between Properties of Southern Forages and Animal Response

Animal Health

Significance of Microflora of Healthy Bovine Udders in Mastitis Control

Endocrine and Muscle Relationships in Swine and Cattle

Role of Endotoxin in Swine Agalactia Syndrome

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Processing and Marketing of Commercially Cultured Catfish

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Neurology of the Reproductive System in the Bull

Virological Aspects of Bovine Respiratory Tract Disease

Resistance to and Epidemiology of Infectious Agents Affecting Bovine Reproduction

Pathogenicity, Diagnosis, and Treatment of Cooperiosis in Calves

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The Role of Endotoxin in the Swine Agalactia Syndrome

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Relationship of Blood Pressure to Blood and Aortic Tissue Lipids and Atherosclerosis in Turkeys

Reproductive Performance of Artificially Inseminated Broiler Breeders Maintained in Cages

BOTANY AND MICROBIOLOGY

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Viral Diseases of Selected Grasses: Identity, Control, and Role in Predisposition
Physiology and Biochemistry of Mycotoxin-Producing Fungi

Epiphytology and Control of Apple and Peach Diseases

Rhizosphere Ecology as Related to Plant Health and Vigor

Viruses and Mycoplasma-Like Organisms Causing Diseases of Corn

Soil-Borne Pathogens of Peanuts, Their Complexes and Control

Biology of Fungal Pathogens Associated with Seedling Diseases in Alabama Forest Nurseries and Plantations

Epiphytology and Control of Scab and Brown Leafspot of Pecan

New or Unusual Plant Diseases in Alabama
Fungal Spore Germination Inhibitors and Stimulators Associated with Surface Waxes of Peanuts
Production of Mycotoxins (Other than Aflatoxin) by Fungi Isolated from Cottonseed
Ecology and Taxonomy of Some Alabama Fungi
Mycotoxicology of Stored Feeds and Seeds
Ecology and Control of Fusiform Rust on Southern Pines
Effects of Environmental Stress Factors on Some Energy-Related Processes of Plants
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Distribution and Habitats of Alabama Poisonous Vascular Plants
Herbicides
Herbicide Movement from Application Sites and Effects on Non-Target Species
Effects of Sodium Azide on the Microflora and Biochemical Activities of Soil
Fate and Effects of Atrazine in Salt Marsh Ecosystems
Insects
Biological Control of Selected Arthropod Pests
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Chemical, Biological, and Environmental Factors Responsible for the Musty/Earthy Odor of the Auburn, Ala., Water Supply
Cotton Production
Influence of Cultural Practices on Short-Season Cotton
Pesticides
Pesticide Action in Salt Marshes With Microecosystems
Activities of Nematicides and Fungicides on Non-target Soil Nematodes and Fungi

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Streams and Impoundments Ecology
Aquaculture Management of Aquatic Plants for Sports Fish Production in Ponds
Catfish Farming
Aeration Effect on Water Quality and Catfish Production
Catfish Diseases
Catfish Breeding
Catfish Nutrition
Processing and Marketing Technology of Commercially Cultured Catfish
Fish Biology
Ichthyology
Fish Diseases
Cooperative Fish Parasite and Disease Study
Fish Feeds and Feeding
Cultural Procedures for Chironomids (Diptera) in the Laboratory and in Ponds
Pond Management
The Culture of Fish, Shellfish, and Aquatic plants in a Closed System
Sportfish Management
Aquaculture

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Forest Practice Alternatives in Central Alabama
Disease Control
Ecology and Control of Fusiform Rust on Southern Pines
Appraisal and Control of Endothia gyrosa on Pin Oak in Alabama
Resource Economics
Economic Alternatives for Managed Woodlots
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Effectiveness of Standardized Forest Condition Classes for Aerial Photographic Forest Inventory Purposes
Forest Products and Technology
Evaluation of Particleboard Constructed from Loblolly Pine Logging Residue
Evaluation of Southern Pine Plywood Properties
Cold Soaking of Fence Posts in Preservative Materials
Regeneration
Reclamation of Surface-mined Lands in Alabama

Forest Genetics and Tree Improvement
Breeding Strategies for Genetic Improvement of Commercial Forest Trees in the South
Genetics, Breeding, and Evaluation of Selected Forest Tree Species
Breeding and Culture of Christmas Trees
Forest Site Quality
Physiographic Classification of Southern Pine Forest Lands
Forest Physiology and Nutrition
Forest Nursery Weed Control
Nitrogen Fertilization of Loblolly Pine (pinus taeda L.)
Growth and Nutrient Requirements of Selected Hardwoods
Forest Stand Improvement
Effects of Selected Silvicultural Practices on Timber Production and Wildlife Habitats
Precommercial Treatment of Semistagnated Natural Stands of Loblolly Pine

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Patterns of Food Intake and Nutritional Health of Girls
Metabolic Basis of Appetite Response to Amino Acid Imbalance and Protein Level
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Textile Utilization
Effect of Near Ultraviolet and Visible Radiation on Selected Non-linear Polamides
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Textile Safety
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Southernpea Breeding for Insect and Virus Resistance; and Nature of Insect Resistance
Genetics and Breeding of Muskmelon and Watermelons
Breeding for Resistance to Gummy Stem Blight and Cucumber Beetles in Pickling Cucumbers
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Height Control in Floricultural Crops
Factors Influencing Vegetative and Reproductive Development of Young Pecan Trees
Nutritional, Cultural, and Varietal Investigation of Apples
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Control of Developing Fruit Depressant Effect on Subsequent Fruit Set and Growth in Annual Crops
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Utilization
High-Fold Freeze Concentration of Fruit and Vegetable Juices
Characterization of Promising Fruit and Vegetable Varieties and Breeding Lines as Food Raw Materials and Processed Foods
Soil Fertility
Soil Fertility and Fertilizer Requirements of Vegetable Crops
Varieties
Performance Trials of Commercially Important Vegetable Crops
Ornamentals
Economics of Producing and Marketing Woody Ornamentals in the South
Identification and Control of Diseases on Ornamental Plants



Solar poultry house nearing completion at Auburn will provide facilities for needed research about use of solar energy to provide energy needs in production.

POULTRY SCIENCE

Disease Control

Relationship of Blood Pressure to Blood and Aortic Tissue Lipids and Atherosclerosis in Turkeys

Genetic Bases for Resistance to the Avian Leukosis Complex

Development of Avian and Fish Virus Antigen Systems

Coccidiosis Study

Coccidia and Coccidiosis of Poultry

Susceptibility of Eimeria Species to Coccidiostats

Diagnostic Services-Poultry

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Condemned Processed Poultry Products and Hatchery Management

Reproductive Performance of Artificially Inseminated Broiler Breeders Maintained in Cages

Paper Mill By-Products as a Source of Litter for Broilers

Development of an Electric Automatic Beak Remover

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Selected Environmental Factors on Feathering, Skin Lesions, and Growth of Broilers

Responses of Chickens to Variations in Air Temperature, Humidity, and Velocity

Utilization of Solar Energy in Poultry Production

Effect of Atmospheric Pollutants upon Disease Susceptibility in Chickens and Quail

Selenium and Vitamin E Functions in Poultry Pesticide Residue Studies

Feeding

Livestock Waste as Animal Feed

Ecology

Reptiles and Amphibians of Alabama

The Hydradephaga (Coleoptera of Alabama)

Ecologic Impacts of Wading Birds on Aquatic Environment

Cotton Production

Influence of Cultural Practices on Short-Season Cotton

Miscellaneous

Auburn University Entomological Museum

Auburn University Vertebrate Museum

RESEARCH DATA ANALYSIS

Statistics

Development and Maintenance of Statistical Analysis System

Evaluation of Irrigation Potential for Alabama

ZOOLOGY-ENTOMOLOGY

Pest Control

Apple Insects

Biology, Ecology, and Control of Forest and Shade Tree Insects

Biological Control of Selected Arthropod Pests

Biology and Control of Arthropod Pests of Woody Ornamental Plants in Alabama

Ecology and Control of Some Parasitic Flies (Diptera)

Biosystematics of Scale Insects of Alabama

Ecology and Management of Heliothis spp. on Cotton, Corn, Soybeans, and Other Host Plants

An Integrated System for the Suppression of Boll Weevil

Control Tactics and Management Systems for Arthropod Pests of Soybeans

Southern Pine Beetle

Biology and Control of Arthropod Pests of Pecans

Biology and Control of Selected Peanut and Soybean Insects

Bionomics and Control of the Pecan Weevil

Vegetable Insects Research

Insect Enemies of Bark Beetles Infesting Southern Pines

Biochemistry and Physiology of Arthropod Pheromones

Wildlife Management

Ecological Studies of Wild Turkeys

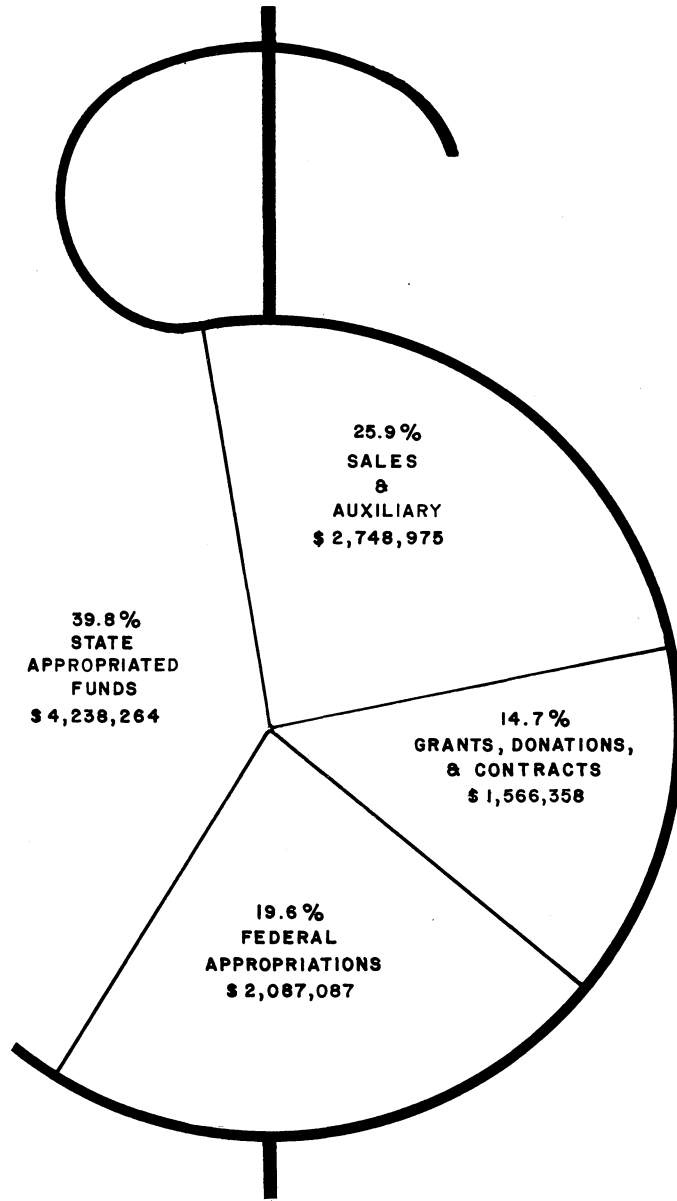
Furbearer and Mammalian Predator Studies

Woodcock Studies

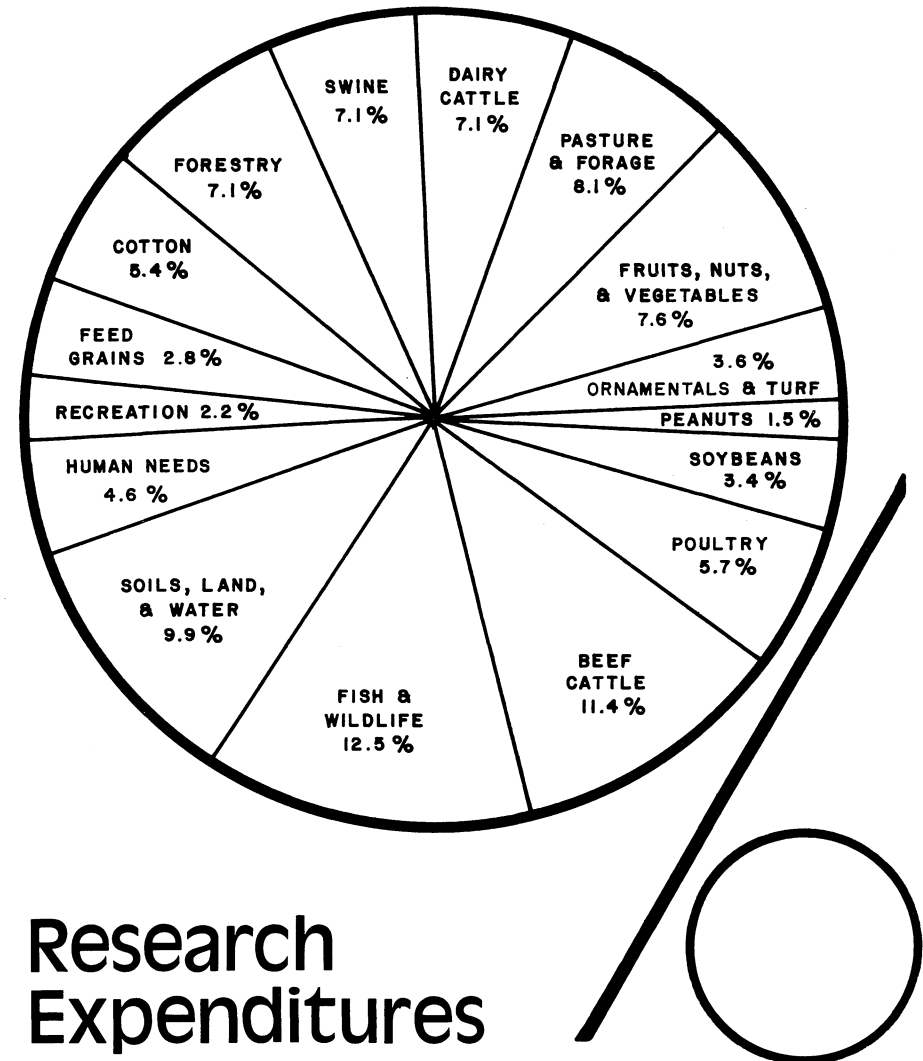
General Wildlife Studies

Bobwhite Quail Studies

FINANCIAL REPORT

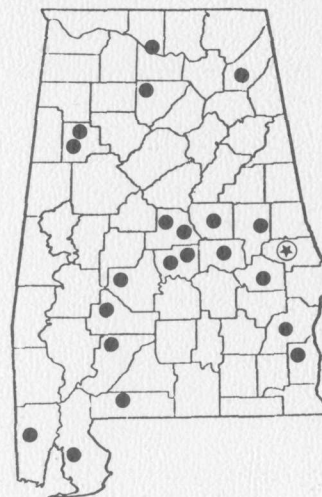


Source of Funds



Research Expenditures

WINDOWS ON RESEARCH



Outlying units of Auburn's Agricultural Experiment Station serve as windows through which Alabamians can see first hand research being done to solve specific problems facing agriculture. The 21 outlying units in the System (located on the map) provide a close tie with Auburn research for every citizen of the State. Each year hundreds of farmers, agricultural industry personnel, and other interested individuals attend meetings at the substations, fields, and specialized units to observe current research. Many others make individual visits to learn about specific experiments underway.