

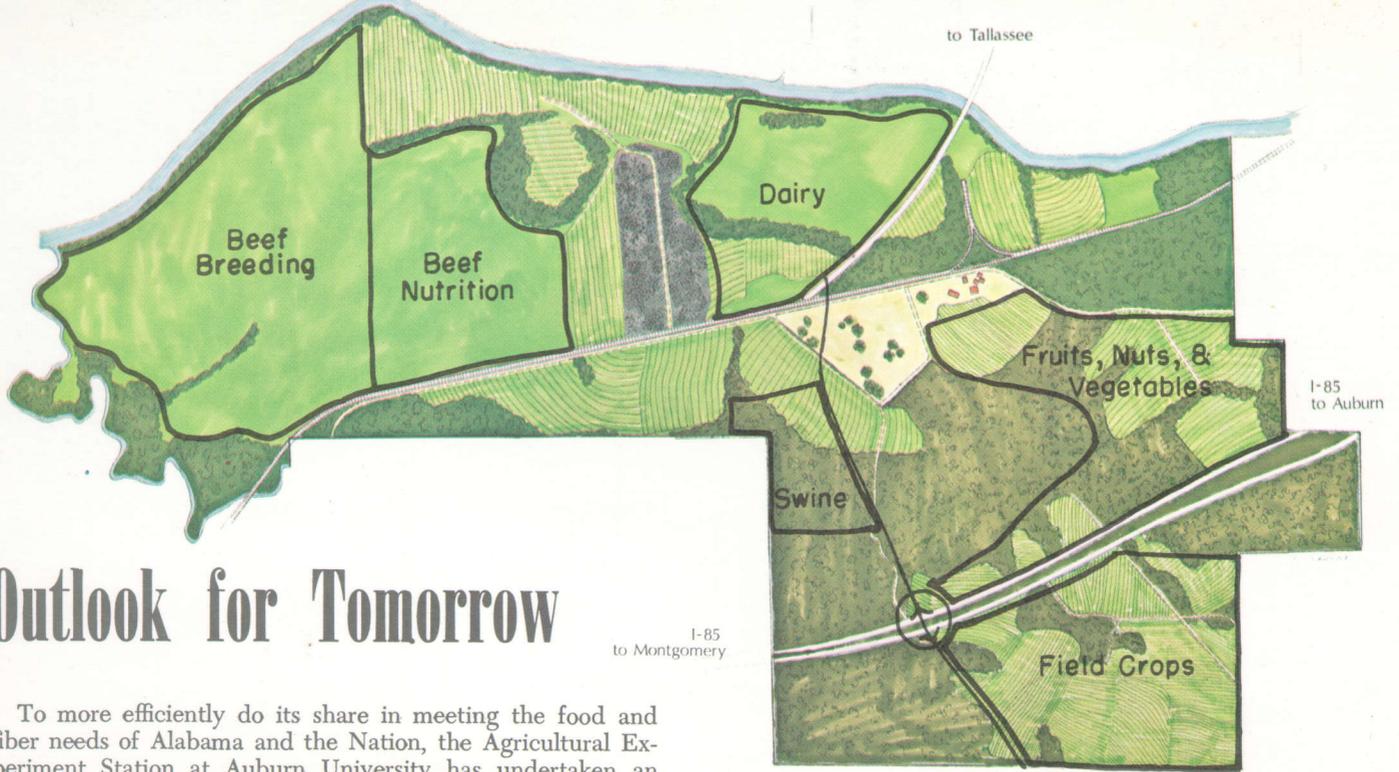
AGRICULTURAL EXPERIMENT STATION  
AUBURN UNIVERSITY  
R. Dennis Rouse, Director Auburn, Alabama

# annual report



**1973 - 74**





# Outlook for Tomorrow

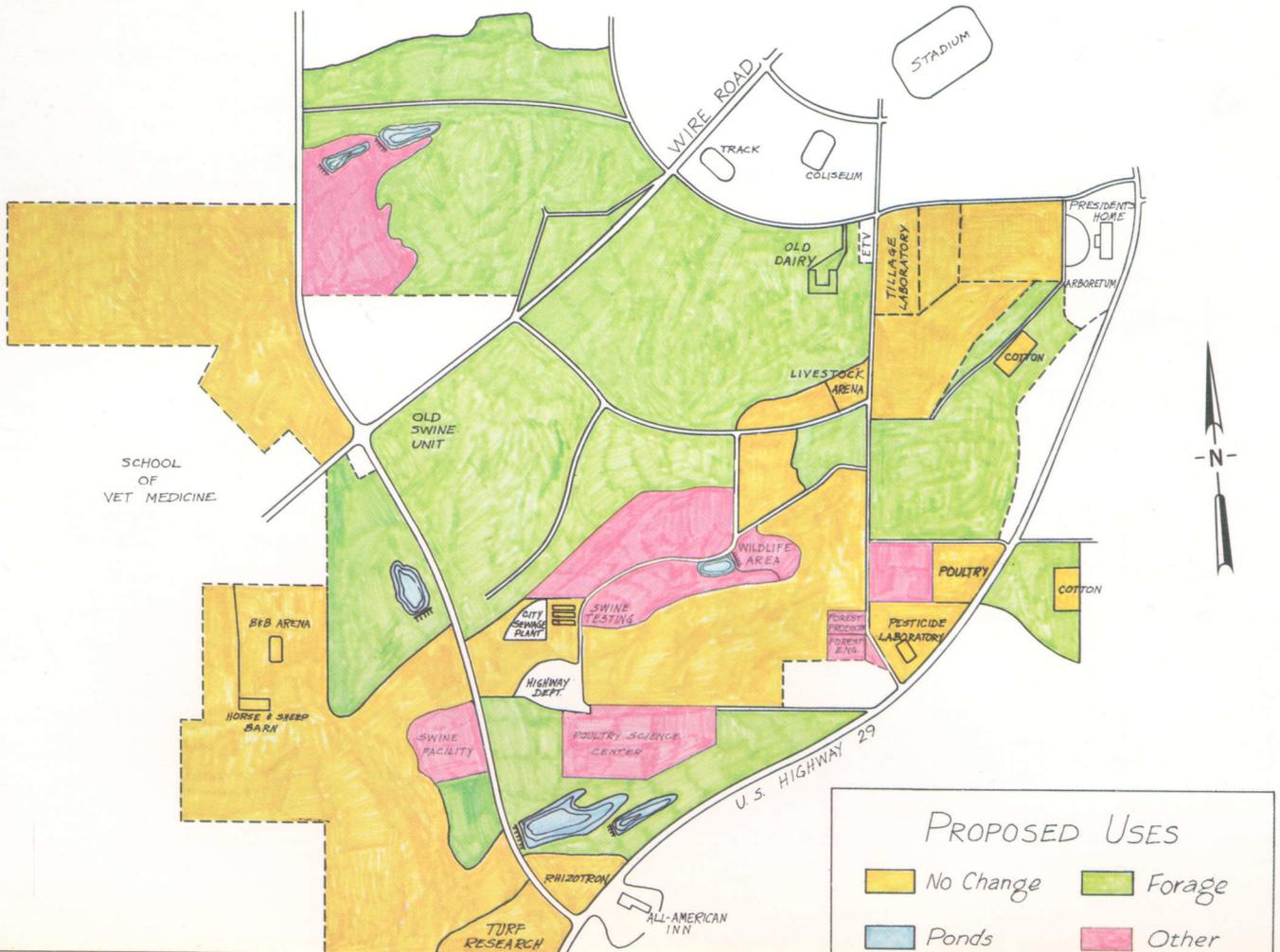
To more efficiently do its share in meeting the food and fiber needs of Alabama and the Nation, the Agricultural Experiment Station at Auburn University has undertaken an extensive upgrading and modernization program. Foremost is the relocation and modernization of Main Station field research facilities. The acquisition of 3,200 acres of prime farm land located between Auburn and Montgomery will make this modernization feasible.

New field research facilities for field crops and for fruit, nut, and vegetable crops, dairy and beef cattle nutrition and management, and beef cattle and swine breeding will be

**Top: New Agricultural Research Center of Auburn University Agricultural Experiment Station. Bottom: Proposed uses of old Main Station land after establishment of new facilities.**

located on this land. These animal units will be serviced by a modern feed mill, and adequate land will be available for production of needed forages.

By shifting most crop and livestock research to this new center, expansion and upgrading of remaining Main Station facilities is possible. A Poultry Science Field Laboratory, Forest Products Laboratory, and Swine Research Unit are planned for the Main Station at Auburn. In addition, more land will be made available for fisheries, forestry, and wildlife research, and for maintenance of a superior beef herd.





Potential food shortages, the need for conserving energy, and problems with land management have made headlines in recent months — as if such problems had just been discovered. Fortunately for Alabama, these and other agricultural problems of man and his environment have received continuous attention and study during the past 100 years at the Alabama Agricultural Experiment Station at Auburn University. Problem-solving research underway at Auburn and at field units throughout the State is constantly updated to keep pace with changing world conditions. Because of this continuing effort, there is a minimum of lag time before solutions are generated, solutions that assure a continued supply of wholesome and appealing food and needed fiber.

Based on the confidence that Auburn's broad based research program will continue to solve problems as they arise, the future for Alabama agriculture and the entire State looks bright. Not only can production be increased, but it can be done while protecting the environment and providing land and resources for high quality recreational enjoyment.

Because of strong interest and concern about agriculture in a time of critical world food problems, we at the Agricultural Experiment Station are instituting a program of publishing annual reports to inform Alabamians about our constant efforts to serve the State. Dedicated to your right to know, this report will bring you up to date on major accomplishments in the immediate past and point out some new areas of concern being investigated. The broad program of research underway directly benefits every citizen of Alabama by supporting the agricultural industry upon which we depend to produce food and fiber to maintain and enrich each person's life. But our research goes farther. It generates information dealing with most aspects of living, to help assure a full and satisfying life for all.

**Directing research of Auburn University Agricultural Experiment Station are (from left) Dr. Charles F. Simmons, Assistant Director; Dr. R. Dennis Rouse, Director; Dr. Irvin T. Omtvedt, Associate Director; and T. E. Corley, Assistant Director.**

Clouds of concern dot the horizon, however, to dim the present glow of success. World-wide problems of increasing population without corresponding increases in productivity point to future famine in many parts of the world, and this puts pressure on American agriculture to boost production. Shortages of petroleum and other materials require agricultural products for sale to balance this nation's international trade.

Even on the State level there are problems that intensify as years pass. Population pressures and urban sprawl continue to take land out of farm production, and economic conditions dictate even more efficient productivity. Thus, there is more and more need for sound, well planned research to keep agriculture healthy and to provide for rural development and land needs of our urbanized society.

The Alabama Experiment Station becomes ever more important to the future of all Alabamians with each passing year. The capital outlay provided by the last Alabama Legislature is making possible much-needed land and facilities for a new and modernized Main Station. Land has been purchased and construction plans are proceeding rapidly. This addition will allow us to better serve Alabama's agriculture, and through agriculture to serve all citizens.

We hope that the words and photos on the following pages will give each reader a better idea of the ongoing efforts by this Agricultural Experiment Station to serve Alabama people, as well as all Americans.

# Report from the Director

# More Food For Our Tables

Quantity and quality, along with production efficiency, are watchwords in food research at Auburn. Efforts include studies on soil fertility, varieties, disease control, mechanical harvesting, and processing of food crops, along with concerted efforts to reduce costly inputs into meat and milk production without quality loss.

## *Accelerated Cattle Growth*

An intensive beef production system that pushes young cattle to slaughter weight by 13 months of age provided highly efficient feed use in Auburn trials. Crossbred bulls gained about 3 pounds per day from weaning to finish on a ration of corn-silage-supplement, reaching 1,050-1,100 pounds at 13 months. This accomplishment was possible because of earlier crossbreeding research at the Experiment Station that provided methods of breeding to get cattle with genetic ability to grow fast.

## *Pasture Fed Beef A Reality*

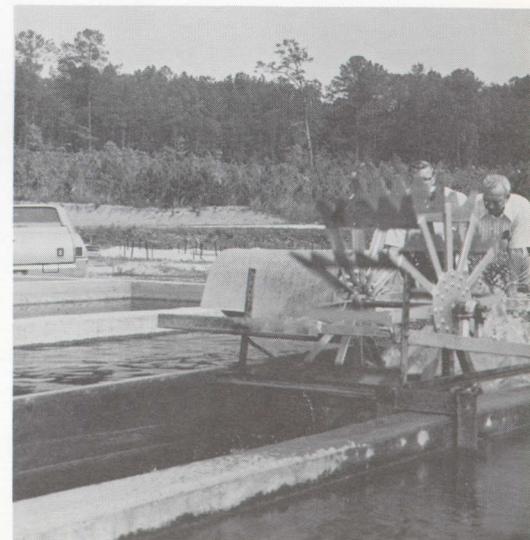
Auburn scientists were primed with a wealth of research facts when economic conditions kindled the fires of interest in producing finished beef on pasture. While "grass-fed" beef is the term heard nationally, Auburn's results with cool-season, clover-grass mixtures indicate that "pasture-fed" would be better terminology. Steers went from 650 to 1,000 pounds each during a 290-day grazing period on Auburn's Yuchi arrowleaf clover grown with rye and ryegrass, and they finished with consumer-pleasing grades of Good to low Choice. No supplemental feed was given these steers, keeping cost of production low for farmer profit and reasonable consumer prices.

## *Recycling Manure for Feed Value*

Feed efficiency in beef production can be raised 10-15 percent by recycling manure to regain wasted feed nutrients, according to results of pioneering work at Auburn. An ensiled ration of 40 percent manure, 48 percent ground corn, and 12 percent ground hay continues to give excellent results. Cattle gain rapidly on this economical feed, and health tests and taste panel evaluation show the meat to be equal to that produced under any feeding system. This Auburn development is being used in various parts of the nation,



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and visitors from around the world come to see for themselves how potentially polluting animal waste is being put to practical and productive use.

### *Liming Soil Boosts Potato Production*

Correct liming of acid soils in Alabama's potato growing sections can do a lot to assure an ample supply of potatoes for Alabama tables. Plots as acid as pH 4.8 produced only 87 hundred-pound bags per acre, while plots limed to correct levels (pH 5.5) in the same field yielded 236 hundred-pound bags. Peanuts showed similar response to lime, going from 1,400 pounds per acre on acid land to 3,700 pounds after liming. Soybeans doubled in yield when a pH 4.8 acid soil was limed properly.

### *Cucumber and Pea Picking Going Modern*

With labor unavailable or too costly to harvest crops like cucumbers and peas, efforts have been intensified to adapt mechanical harvesting methods. "Multi-pick" cucumber harvesters that pick cucumbers without destroying vines to permit repeated harvests were used successfully in Auburn trials. Specialized tillage requirements were identified to suit demands of the picker, even on hilly land. Small growers haven't been forgotten either, with efforts directed toward better fruiting, higher quality varieties.

Field peas, a Southern favorite, aren't likely to disappear from food store freezers and cans, thanks to progress being made in adapting this traditional crop to machine harvest. Cream type peas have proved best for commercial processing, and yields as high as 1½ tons per acre have been made of a variety suited to mechanical harvest. Fresh market peas are easier to produce now that breeders have incorporated resistance to a troublesome disease called bean yellow mosaic.

### *Getting the Red into Apples*

Alabama's warm nights interfere with development of the red color of apples demanded by consumers, but this drawback is about to be solved by a spray system devised in Auburn research. Spraying with the growth regulator Ethepon gives 100 percent red color of apples that normally develop only partial red coloration, and has the dual advan-



Page 4: upper left—multi-pick cucumber harvester made to work on hilly ground; lower left—worms effectively controlled on collards, as evidenced by treated and non-treated plants; lower right—using paddle wheel to aerate water resulted in catfish production as high as 19,000 pounds per acre. Page 5: upper right—steaks from steers fed experimental rations are cooked before testing for tenderness and taste by machine and taste panel; lower right—correct liming of acid soil boosted potato production; lower left—progress made toward developing processing peas for mechanical harvest.



tage of speeding ripening to get a high quality harvest to market ahead of competing regions.

### *Health Insurance for Peanuts*

A system of correlating peanut disease control treatments according to weather conditions was recently developed by Auburn scientists to make treatments more efficient. The result of this cooperative effort with the NOAA Environmental Studies Service Center is better control of leafspot with cost savings. White mold and root-knot nematodes are other peanut enemies for which effective treatments are being established.

### *Germ Warfare Against Insects*

6 Microorganisms that cause diseases of insects are being enlisted in the fight against insects that damage food crops. One such pathogen, a bacterium, has effectively controlled various worms on collards, tomatoes, soybeans, and water tupelo trees. This organism is safe, leaves no bothersome residue, and has little effect on non-target organisms — just what the ecologist, consumer, and agriculturist want.



### *Keeping Weeds out of the Greens*

Mechanical devices, cultural practices, biological agents, flame, and chemicals have been used in the never ending battle to control weeds, crop enemies that pester farmers and drive up food and fiber costs. Chemical weed killers have largely replaced the hoe on farms, but desired levels of control still are in the future for some crops. Crop safety, weed control, and economy are emphasized. Economic thresholds are being established for major crops to determine level of weed control necessary for most profitable yields, and information is obtained on new herbicides as they are made available by industry. New findings that weeds can germinate at much drier conditions than crops has identified the need for chemicals that are activated at low soil moisture levels.

### *Deprived Roosters Contribute to Efficiency*

A workable system of artificial insemination of broiler breeders developed at Auburn promises faster results in breeding better broiler chicks. The system permits cage production of broiler hatching eggs without loss of hatchability. Thus, desirable roosters can sire four times as many offspring as in floor flocks. Use of insemination equipment developed at Auburn halved requirements for labor — the big drawback to artificial insemination. A semen extender was perfected that further reduces labor needs.

Upper left—cost saving methods of peanut leafspot control have been developed; upper right—timely irrigation doubled tomato yield and improved quality; lower left—beef animals finished on clover-grass pasture are viewed by field day audience; lower right—increasing efficiency of cotton stripper is aim of one significant project.





# Energy Conservation

No johnny-come-lately to the energy conservation game, the Agricultural Experiment Station intensified efforts in this critical area during 1973-74. Station scientists branched out into new and innovative approaches, going far beyond what is usually considered energy conservation.

## *Putting Fungi to Work*

Using filamentous fungi to degrade sewage sludge is being considered as an energy-saving way of getting more complete disposal of sewage treatment solids, the major problem in waste-water treatment. Not only would this be an economical treatment, there is the potential by-product of fungal protein for recycling as animal feed.

## *Legumes Getting Fashionable Again*

Auburn's ongoing research with legumes grown in rotation with row crops, a topic pretty generally ignored in modern times, is providing timely information now that commercial nitrogen is scarce and expensive. Last year's results confirmed that a crop of vetch turned under ahead of cotton or corn produces yields that equal or surpass production from recommended rates of nitrogen. Continuous cotton grown with legumes since the "Old Rotation" was begun in 1896 averages nearly 2 bales per acre and a 2-year rotation of cotton-winter legumes-corn-winter legumes with no fertilizer nitrogen makes high production of both crops. Auburn's Yuchi arrowleaf and Regal ladino clovers furnish the nitrogen needed by grasses in combination pastures while improving forage quality.

## *Sometimes Less Is Best*

Following Auburn Soil Test Laboratory recommendations has been found to provide highly efficient fertilizer use on Alabama crops. For soils with big quantities of accumulated plant foods, Auburn tests prove that leaving off phosphorus and potassium fertilizer for a year or two permits the farmer to cash in on past fertilizations without any loss in productivity. Small applications often prove to be just as good as larger amounts. For example, findings are that overuse

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Top—winter legumes supplied nitrogen for this corn to replace costly commercial sources; left—Japanese group came to Auburn to learn about using processed animal waste as a valuable ration ingredient.

Management to maintain clover-grass pasture mixtures is getting major research emphasis.

### *Innovative Cropping Systems Increase Production*

Interplanting corn and soybeans to get skip-row effect without sacrificing use of half the land area showed real potential last year. Yields went as high as 253 bushels of corn per acre in a system using two rows of corn alternated with four rows of soybeans, an increase of 113 bushels over conventional solid plantings. Efforts are continuing to find best row patterns and methods to get soybean production much higher than the 15-16 bushel yield level of the test to make most efficient use of land, sunlight, and soil moisture. Planting corn or grain sorghum in rye stubble for production without cultivation (called no-till farming) gave excellent results. Narrow-row corn planted after rye grain harvest produced 18 tons of silage per acre, or 106 bushels if harvested for grain.

### *Hay Handling Goes Modern*

No research project in recent history has so intrigued Alabama farmers as studies on mechanized, labor saving methods of hay harvesting and storing. The system that proved most advantageous from labor saving and cost standpoint was the use of large round bales (weighing about 950 pounds). Put up by a relatively inexpensive commercial baler, the round bales are loaded by tractor front end loader, stored in a central outside area with minimum weather damage, and then loaded and hauled the same way to a feeding area. Collapsible panels that fit around the large bales proved economical by saving hay during feeding. Other handling systems evaluated included use of machine prepared stacks and mechanized handling and feeding of conventional bales, all of which showed some merit.

### *Energy Savings in the Chicken House*

Important savings of energy for heating poultry houses have been identified in Auburn research. Previous Auburn poultry health advances make possible restricting of young broilers to small areas of houses for sizeable fuel savings. Proper insulation of houses was found to reduce heat loss

Storing and feeding hay in large round bales proved efficient in recent experiments comparing various haying systems.



is more common than underuse when fertilizing crops like tomatoes and potatoes. Economy is often possible with a full rate of fertilizer by using fewer acres to produce a needed amount instead of cutting back on use of scarce fertilizer on larger acreage. Better use of applied fertilizer results from liming acid soil, which improves efficiency of production.

### *Catfish Processing Waste Isn't Waste*

When farm-raised catfish go through a processing plant, only 60 percent of weight winds up in the grocery store. The other 40 percent (head, entrails, and skin) is considered waste. But there are many nutrients locked up in this waste, and Auburn research points to possible use of the waste product in feed for swine or fish to conserve scarce conventional feed ingredients.

### *Engineering Economy Gets Attention*

More complete utilization of farm machinery and minimum operating costs are potential results of a mathematical method of predicting machine performance being developed at Auburn. Accurate performance rates of machines can help farmers get maximum efficiency from time and fuel. Computer control of tractors is also under study in efforts to develop automatic guidance systems for even greater efficiency.

### *Coping with Manure Disposal Problems*

Although recycling of animal waste can effectively reduce the amount to contend with, there will still be a problem of manure disposal. Both soil application to take advantage of fertilizer nutrients and lagoon disposal of waste from dairy and hog farms have been studied. Rates as high as 20 tons manure per acre proved safe to use in cropping systems, and yields of double-cropped millet and rye were excellent. Forage quality was high and there was no reduction in quality of runoff water from land where manure was soil incorporated. Lagoons take care of dairy waste disposal without pollution problems, as shown by a 33-month study in which there was no odor or fly problem and no water was removed from the lagoons except when heavy rainfall caused some overflow. A new project just getting underway will investigate using water from a second-stage lagoon as flush water for dairy and swine facilities and as irrigation water.

Different spacings and interplanting are being tried in research efforts to increase cottonwood production.

by some 25 percent, and correct care and maintenance of gas-fired brooders provide further savings. Potential for using solar energy in poultry house heating also is getting attention.

Wise use of land resources is a must as America's expanding population claims increasing acreages for buildings, highways, recreation, service, and industrial complexes. Research on erosion control, cropping methods, and reclamation of waste areas is providing information needed to make the most of available natural resources.

### *Face Lift for Surface Mined Lands*

Surface mined areas are eyesores and unproductive, but recent Auburn research indicates the potential for getting useful vegetative cover to improve appearance and put land back into productivity. Sycamore trees and bicolor lespedeza (an excellent wildlife food and cover crop) both made excellent growth. Adequate pasture has been established on such spoil areas by wise use of lime and fertilizer and planting of erosion controlling grazing crops.

### *Overcoming Problem of Soil Compaction*

Controlled traffic farming offers a method of reducing soil compaction from heavy equipment, to overcome crop losses from shallow rooting and poor water retention. In this system, wide wheel spacings are used with wheels traveling on the same area each year. This leaves untraveled rows and middles free of compaction to produce at full potential. Deep tillage is another method of overcoming compaction, giving up to 37 percent higher yields of cotton in the Auburn tests. Growing crops like bahiagrass, which have deep growing roots that can penetrate compacted soil, is another way being evaluated to overcome this problem.

### *War Against Erosion Goes On*

Eliminating troublesome waterways by extending terraces across the drainage channel and forming impoundment areas to collect and discharge excess water through underground pipes is showing promise for erosion control. This has advantages of longer field rows plus discharging cleaner water



from fields. Computers are used to design the systems so the engineer can quickly determine best pipe sizes and water storage needs of a tile outlet system.

### *Soybean Irrigation Shows Possible Profit*

With soil moisture at time of soybean pod filling largely determining yield, a few timely irrigations could result in significant yield improvements when drought strikes. Soybeans double-cropped with small grains made 44 to 50 bushels per acre when irrigated, a 34 percent boost from applying less than 3 inches of water. Yield increases of this magnitude could make irrigation highly profitable even with beans at lower than current prices, especially if irrigation equipment could be used with other crops as well.

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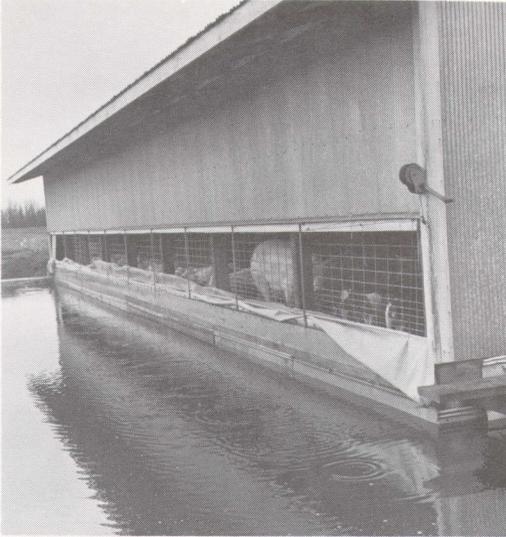
# Land Use Management



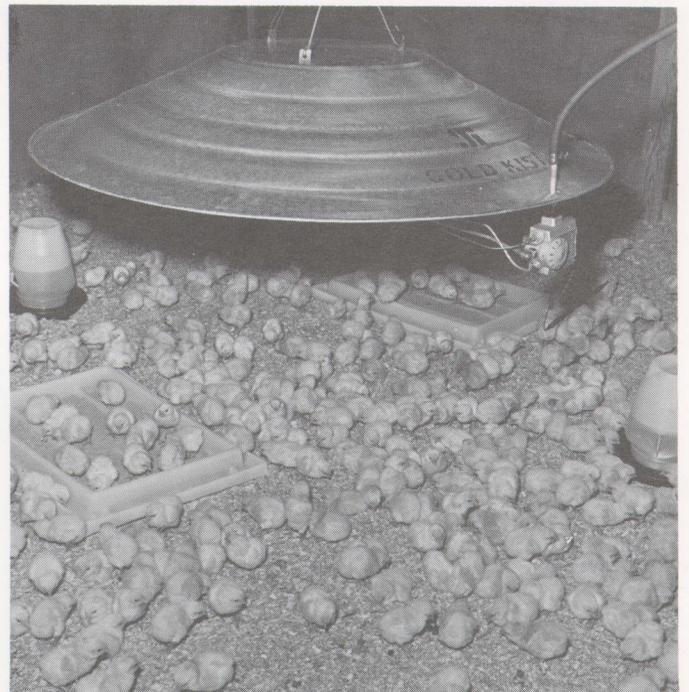
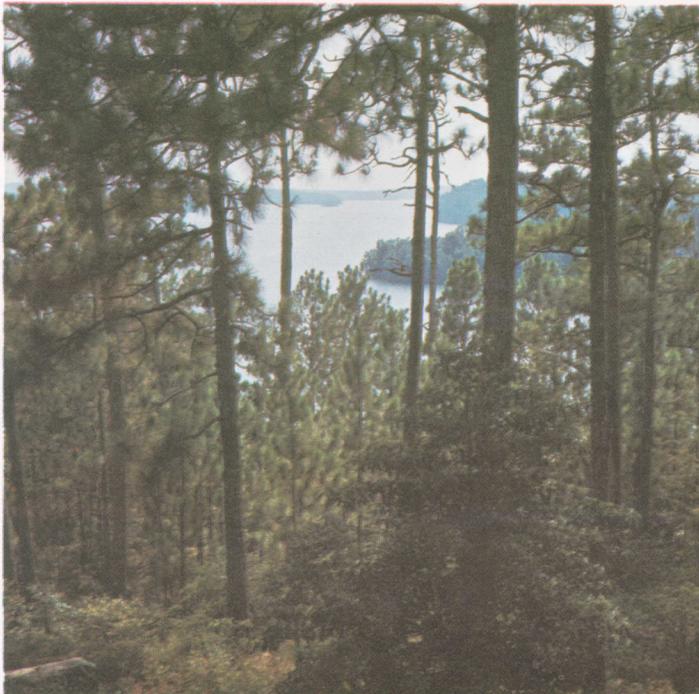
Left—information needed for Christmas tree production is being gained in production studies; below—several breeds of cattle are being used in crossbreeding research.



# Environmental Quality



# Recreation



# Health & Safety

Page 10: upper left—lagoons perfected for pollution free manure disposal; upper right—height and size of bloom are important measures of snapdragon variety desirability; lower left—maintaining purity of streams and lakes is important part of research at Auburn; lower right—new findings assure safety of poultry and eggs.

Along with making major efforts to most economically produce the necessities of life, Experiment Station researchers are vitally concerned about the things that make for the "good life"—quality of the environment, recreation, health and safety. Even though the environment gets attention in all projects, specific studies are carried out with environmental protection a primary objective. Studies involve checking poultry and eggs for accidental pesticide contamination, developing pest management systems that guard against overuse of a single pesticide, making useful products from forest residue, evaluating flame retardant finishes for fabrics, and recreation related research involving development of plans to fit specific needs for fun and play, assuring good hunting and fishing, and using recreation to strengthen the State's economy.

### *Keeping Atop the Garbage Pile*

Savings in garbage disposal through use of landfills serving a several-county region appear possible, based on Auburn research. Findings of the survey study were used to determine best locations and pick-up routes for a regional disposal system serving Lauderdale, Colbert, Franklin, Marion, and Winston counties in northwest Alabama. Also contributing to improved operation of landfills is a project at Auburn's Rhizotron (root studying laboratory) that is studying effects of buried solid waste on growth of vegetation and on water quality from such areas.

### *Aquatic Beetles as Stream Pollution Watch Dogs*

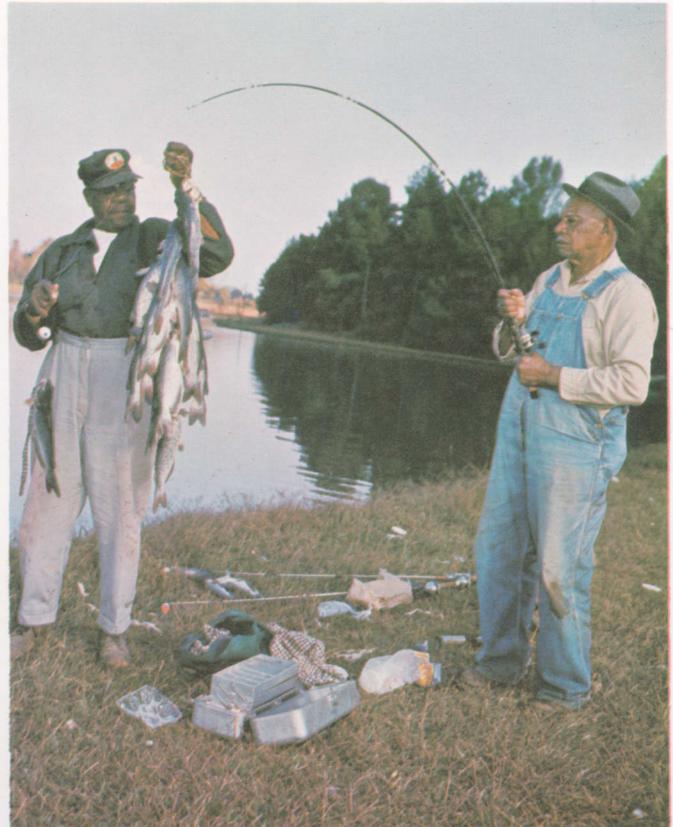
Auburn researchers are investigating how water beetles can be used in monitoring stream environment, since many such aquatic insects serve as accurate indicators of what is happening in streams. Some respond to chemical water pollutants, others show the presence of excess nutrients, and still others indicate when there are high sediment loads or physical disturbance in their bodies of water. There are more than 200 kinds of aquatic beetles found in Alabama waters, many of which are valuable also for fish food.

### *Pest Management for Safe, Effective Control*

Insect control research at Auburn has emphasized integrated control methods and other approaches aimed at providing effective suppression of damaging crop pests with a minimum of chemical use to avoid environmental damage. In the case of cotton, success has been achieved using a combination of diapause control, resistant host plants, sex attractant baited traps, sterile insect release, and intensive scouting. Soybeans were found to tolerate heavy attacks by some insects with no yield loss, leading to recommendations for a minimum of insecticide use.

### *Keeping Poultry and Eggs Safe*

Concern that residues of chlorinated hydrocarbon insecticides from past applications might contaminate poultry meat and eggs led to a study that confirmed safety of these food products. Findings show that broilers can be grown on



Management of farm ponds to provide recreational fishing and be a source of farm profit is a continuing program.

pesticide-contaminated dirt floors without building up dangerous residues in the meat, but necessity of keeping chemicals out of feed was emphasized for both broilers and layers because of contamination danger.

### *Flame Retardant Clothing Safety Protected*

Correct care of flame retardant fabrics required for children's sleepwear by Federal standards showed up as a critical factor in maintaining fire protection. Soiling with such foods as homogenized milk, reconstituted nonfat dry milk, or baby cereal causes some flame retardant fabrics to lose their flame retardant qualities, Auburn results revealed.

### *State Recreation Gets Auburn Emphasis*

The advertising claim that "Alabama Has it All" is a well-deserved pat on the back that recognizes efforts of the State to cash in on its abundant natural resources. Auburn's Experiment Station has played a major role in recent-year efforts to increase use of Alabama's facilities by State residents and out-of-state visitors to make recreation and tourism—already the number three industry behind manufacturing and agriculture—even more important to the economy. Major development and improvement of seven state parks and improvements to others came about in part because of detailed study by Auburn researchers under a contract project from Alabama Department of Conservation. Nearing completion is a study of recreational and forest management needs for land around lakes and impoundments of U.S. Army Corps of Engineers projects under the Mobile and Savannah District offices. Implementation of these plans should provide increases in facilities for water oriented recreation, hunting,



Above—use of dwarfing chemicals to shape various ornamentals into unusual and desirable house plants is an intriguing new project; below—solving fish disease problems is leading to better fishing in ponds, lakes, and streams of Alabama.

and fishing, while protecting the environment for future generations to enjoy.

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### *Pond Fishing in a Hurry*

A new stocking method developed at Auburn cuts down on the waiting time between stocking and fishing a new or renovated farm pond. Overcrowding with bass and stocking bluegills at the standard rate resulted in bluegills averaging more than one-fourth pound being caught the first year after stocking, and reaching nearly half-pound size the second year. Guidelines for fishing pressure under this system were suggested by the research.

### *Game Supply May Exceed Pre-Statehood Days*

Efforts by wildlife researchers have played a major role in development of Alabama's hunting that, despite transition from a rural to an urban state, probably is superior for such species as deer and wild turkey than when Indians hunted from the Tennessee Valley to the Gulf of Mexico. New work is developing methods of management that may lead to the American woodcock becoming an important game bird in Alabama. Altered hunting seasons are needed since the first month of the nesting season falls within current hunting time, and traditional burning to improve quail hunting takes place at a time when woodcock nests and young brood are vulnerable.



# PROJECTS

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

### Crop, Livestock, and Poultry Production and Management

Evaluation of Growth Potential for Beef Industry  
Crop and Beef Production Systems, Lower Coastal Plains  
Socio-Economic Factors Involved in Contract Broiler Production  
Full-Time Hired Farm Labor Situation in Alabama  
Economic Position of Selected Alabama Agricultural Enterprises

### Marketing of Agricultural Products and Policy Implications

Economic Analysis of Dairy Marketing Organizations  
Alternative Forms of Vertical Coordination in Livestock Industry  
Effects of Policy and Technological Changes in Grain Marketing  
Contract Marketing of Cotton  
Processing and Marketing Catfish

### 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  
Implementing Continuance Planning in Outdoor Recreation, III  
Implementing Continuance Planning in Outdoor Recreation, IV  
Profiling the Forest Incendiarist: Documented Case Histories  
Preparation of Forestry Management, Fire Protection, and Fish and Wildlife Plans for Mobile District Lake Projects  
Preparation of Forestry Management, Fire Protection, and Fish and Wildlife Plans for West Point Lake, Chattahoochee River

### Rural Development

Rural Development and Quality of Life in the Rural South  
Human Resource Potentials and Mobility of Rural Youth  
Public Services and Economic Development in Rural Communities  
Post Project Evaluation of Cheaha Creek Watershed Development  
Solid Waste Management for Northwest Alabama  
Impact of Expanded Food and Nutrition Education Program

## AGRICULTURAL ENGINEERING

### Disease Control

Effect of Atmospheric Pollutants Upon Disease Susceptibility in Chickens and Quail

### Cotton Production

Engineering Systems for Cotton Production  
Cotton Plant Water Potential as Influenced by Various Tillage and Traffic Practices  
Development and Evaluation of Tillage and Cultural Practices  
Influence of Cultural Practices on Short-Season Cotton  
Correction of Subsoil Acidity in Cotton Production

### 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

### Conservation

Tile-Outlet Terraces for Erosion Control in the Southeast

### Irrigation

Irrigation Scheduling and Application in Humid Climates

### Farm Machinery

Determining Farm Machinery Capacities  
Automatic Direct Digital Control for Steering Tractors



Beef produced on pasture is not only less expensive, but it has proved to be of desirable quality as well.

### Fisheries

Aeration Effect on Water Quality and Catfish Production

### Waste Control

Animal Waste Treatment and Recycling Systems

### 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  
Acid-Soil Infertility  
Phosphate Reaction and Transformations in Soils  
Diagnosis and Correction of Zinc Problems in Corn and Rice  
Relationship Between Micronutrients in Soils, Uptake and Response  
Factors Affecting Vertical Movement of Nitrates  
Soil Testing and Plant Analysis

### Soil Classification

Taxonomic and Interpretive Classification of Alabama Soils

### Forage Crops

Physiological and Environmental Factors Affecting Forages  
Chemical Profile and Nutritive Value of Forage Genotypes  
Establishment and Management of Pasture, Hay, and Silage Crops  
New Plant Introduction, Multiplication, Evaluation, Preservation

### Plant Breeding

Genetics, Breeding and Evaluation of Sericea and Vetch  
Breeding *Festuca* and *Phalaris* Species for Winter Production

### Cotton Production

Influence of Cultural Practices on Short-Season Cotton  
Breeding Cotton for Intensive Cultivation  
Evaluation of Cotton Varieties and Strains

### Weed Control

Economic Thresholds of Weed Populations in Cotton  
Chemical and Biological Weed Control in Agronomic Crops

### Soybean Production

Herbicide-Tillage Interactions on Soybean and Soil in Monoculture System  
Soybean Variety and Experimental Strain Evaluation  
Cropping Systems and Moisture and Fertility for Soybeans

### Grain Crops

Grain Crops Variety and Experimental Strains Testing

## Environment

Fertilizers and Organic Wastes Applied to Soils  
Reclamation of Surface-Mined Lands in Alabama

## Pesticides

Inactivation and Loss of Pesticides from Soils

## Turfgrass

Turfgrass Evaluation and Management

## Vegetable Production

Plant Nutrient Requirements of Vegetable Crops

## Herbicides

Cultural and Environmental Effects on Herbicide Persistence

## Beef Production

Crop and Beef Production Systems, Lower Coastal Plains

## ANIMAL AND DAIRY SCIENCES

### Nutrition

Nucleic Acid Metabolism in the Ruminant

Dairy Cow Performance on Low-Cost Computerized Rations

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

Vitamin E for Swine Research in Confinement

Structure and Metabolism of Lipids Containing Branched-Chain Fatty Acids

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

Physiological Responses of (A) Brood Sows Fed Grain and (B) Dairy Cows Fed Grain and Silage from Blighted Corn

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

Effect of Level and Quality of Protein on Lactation in Dairy Cattle

### Feeding

Growing and Finishing Stocker Cattle in the Gulf Coast Area

Growing-Finishing Systems for Beef Steers in North Alabama

Evaluation of Two Feeding Systems for Growing Light Weight Stocker Cattle in the Wiregrass Area

A Comparison of Cool Season Grazing and Corn Silage for Growing Stocker Cattle in the Piedmont Area

Evaluation of Pastures for Yearling Beef Steers (Limited vs. Continuous Grazing by Stocker Beef Steers)

Growing-Finishing Systems for Steers in the Coastal Plains

Crop and Beef Production Systems, Lower Coastal Plains

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

### Breeding

Evaluation of Crossbred Beef Cattle

Evaluation of Prospective Boars

Performance Testing of Prospective Sires

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

Selected Reproductive Phenomena in Cattle and Swine

### Dairy Production

Ecology of Psychrophilic Bacteria in Fluid Dairy Products

Development of Prediction Tests for Microbiological Quality of Fluid Milk Products

Silage-Concentrate Blended Rations for Dairy Cows

Regal Ladino White Clover in Forage Systems for Dairy Cattle in the Black Belt

Effect of Level and Quality of Protein on Lactation in Dairy Cattle

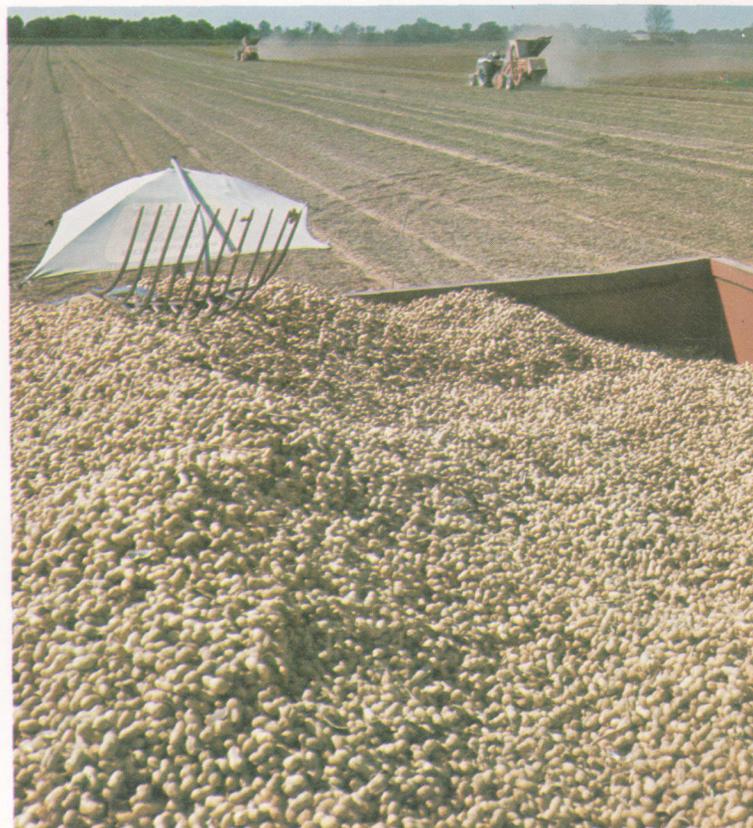
### Waste Management

Animal Waste Treatment and Recycling Systems

Lagoon Waste Management and Recycling Systems for Confined Dairy Cattle

### Meat

Effect of Preslaughter Immobilization on Pork Quality



Heavy harvest of top quality peanuts results when latest research information is used in production.

Effect of Infusion of Lipids and Salts on Meat Flavor and Tenderness

Factors Responsible for Tenderness Variation in Meat

### Beef Production

Breeding Methods for Beef Cattle in the Southern Region

Pasture Evaluation with Beef Cows Nursing Calves

### Swine Production

Modified Gamete Selection as a Method of Swine Improvement

### 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

Thyroid Activity and Associated Endocrine Function in Stress-Susceptible Swine

### Fisheries

Processing and Marketing Catfish

## ANIMAL HEALTH RESEARCH

### Cattle

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

Evaluation of Milking Techniques and Hygienic Measures in Control of Bovine Mastitis and Improvement in Milk Quality

### Swine

The Role of Endotoxin in the Swine Agalactia Syndrome

### Poultry

Effect of Atmospheric Pollutants Upon Disease Susceptibility in Chickens and Quail

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

Reproductive Performance of Artificially Inseminated Broiler Breeders Maintained in Cages



Different intensities of weed competition—crabgrass in this instance—made a big difference in cotton growth.



The brown recluse spider was just one of many species found in an Alabama survey that began with a project in which more than 100 species of spiders were identified in cotton.

## BOTANY AND MICROBIOLOGY

### Disease Control

Physiology and Biochemistry of Mycotoxin-Producing Fungi  
 Epiphytology and Control of Apple and Peach Diseases  
 Rhizosphere Ecology as Related to Plant Health and Vigor  
 Soil-Borne Pathogens of Peanuts, Their Complexes and Control  
 Mycotoxins and Seed in Storage  
*Biology of Fungal Pathogens Associated with Seedling Diseases in Alabama Forest Nurseries and Plantations*  
 Growth and Toxin Production of Food Storage Fungi  
 Characteristics of Viruses Infecting Selected Grasses  
 Epiphytology and Control of Pecan Foliar and Nut Diseases  
 Viruses and Mycoplasma-Like Organisms Causing Corn Diseases  
 Effect of Soil Amendments on Nematode Behavior and Survival  
 New or Unusual Plant Diseases in Alabama  
 Fungal Spore Germination Inhibitors and Stimulators Associated with Surface Waxes of Peanuts  
 Interactions of Herbicides and Soil Borne Cotton-Disease Fungi  
 Production of Mycotoxins (Other than Aflatoxin) by Fungi Isolated from Cottonseed  
 Ecology and Taxonomy of Some Alabama Fungi  
 Mycotoxicology of Stored Feeds and Seeds

### Plants

Effects of Aging on Some Energy-Linked Functions of Plant Mitochondria  
 Poisonous Plants of Alabama

### Herbicides

Herbicide Movement from Application Sites and Effects on Non-Target Species  
 Effects of Sodium Azide on the Microflora and Biochemical Activities of Soil  
 Effect of Arsenic Herbicides on a Salt Marsh Ecosystem

### Insects

Biological Control of Insects and other Arthropod Pests

### Waste Management

Municipal Sewage Sludge as a Substrate for Industrial Fermentations

### Environment

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

## FISHERIES AND ALLIED AQUACULTURES

### Aquatic Ecology

Streams and Impoundments Ecology  
 Farm Ponds

### Catfish Farming

Aeration Effect on Water Quality and Catfish Production  
 Farm Ponds  
 Epizootiology of Parasitic Diseases in Fish Populations Under Intensive Management  
 Catfish Diseases  
 Catfish Breeding  
 Catfish Nutrition  
 Processing and Marketing Catfish

### Fish Biology

Ichthyology

### Fish Diseases

Cooperative Fish Parasite and Disease Study  
 Epizootiology of Parasitic Diseases in Fish Populations under Intensive Management  
 Catfish Diseases

### Fish Feeds and Feeding

Farm Ponds  
 Cultural Procedures for Chironomids (Diptera) in the Laboratory and in Ponds

### Pond Management

Farm Ponds  
 Dynamics of Algae Populations in Farm Fish Ponds

### Sport Fish Management

Farm Ponds

## FORESTRY

### Resource Management

Forest Practice Alternatives in Central Alabama  
 Forest Practice Alternatives in Natural and Artificial Stands

Various Forest Management Practices in Farm Type Woodlands

**Resource Economics**

Economic Alternatives for Managed Woodlots

**Forest Measurements**

Effectiveness of Standardized Forest Condition Classes for Aerial Photographic Forest Inventory Purposes

**Forest Products and Technology**

Improving Marketability of Southern Yellow Pine Particle Board

Evaluation of Southern Pine Plywood Properties

Color in Sweetgum (*Liquidambar styraciflua* L.) Wood

Cold Soaking of Fence Posts in Preservative Materials

**Regeneration**

Survival and Early Growth of Selected Hardwood and Pine Species

Planted in Bottoms and Slopes of Upland Hollows

Reclamation of Surface-mined Lands in Alabama

**Forest Genetics and Tree Improvement**

Genetic Improvement of Forest Trees in the South

Influence of Geographic Seed Sources on Forest Tree Performance

Genetics, Breeding, and Evaluation of Certain Forest Trees in Alabama

Breeding and Culture of Christmas Trees

Genetics and Breeding of Selected Forest Tree Species

**Forest Site Quality**

Determination of Site and Pine Forest by Indicator Vegetation

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

**HOME ECONOMICS RESEARCH**

**Nutrition**

Factors Affecting Dietary Habits of Teenage Families

Patterns of Food Intake and Nutritional Health of Girls

Metabolic Basis of Appetite Response to Amino Acid Imbalance and Protein Level

Metabolic Changes in Rat Adaptation to Low Sulfate Diet

**Textile Utilization**

Consumer Perceptions of Changes in Fabric Properties

**Textile Safety**

Performance of Fabrics Treated with Flame Retardant Finishes

Effect of Alkaline Earth and Alkali Metal Ions on Flame Retardancy of Selected Fabrics

**HORTICULTURE**

**Breeding**

Breeding Improved Tomato and Pepper Varieties for the South

Genetics and Breeding of Plums

Southernpea Breeding for Insect and Virus Resistance

Genetics and Breeding of Muskmelon and Watermelons

Breeding for Resistance to Gummy Stem Blight and Cucumber

Beetles in Pickling Cucumbers

Development and Evaluation of Root Stocks for Peach

**Management**

Height Control in Floricultural Crops

Factors Influencing Vegetative and Reproductive Development of Young Pecan Trees with Trickle Irrigation

Nutritional, Cultural, and Varietal Investigation of Apples

Regulation of Pistillate Flowering Processes in Pecan

Control of Developing Fruit Depressant Effect on Subsequent Fruit Set and Growth in Annual Crops

Peach Nutritional, Cultural, and Varietal Investigations

**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

Factors Affecting Utilization and Expansion Potential for Ornamental Plants and Turf

**Soil Fertility**

Plant Nutrient Requirements of Vegetable Crops

Nutritional, Cultural, and Varietal Investigations of Apples

Peach Nutritional, Cultural, and Varietal Investigations

**Varieties**

Performance Trials of Selected Varieties and Breeding Lines of Certain Vegetable Crops

Nutritional, Cultural, and Varietal Investigation of Apples

Peach Nutritional, Cultural, and Varietal Investigations





**Top**—slatted floors of different types are being tried to increase efficiency of swine production on State farms; **bottom**—an Auburn developed method of artificial insemination of broiler breeders is making possible accelerated breeding progress.



## POULTRY SCIENCE

### Disease Control

Relationships of Certain Poultry Practices to the Avian Leukosis Complex (Marek's Disease and Lymphoid Leukosis)  
 Effect of Atmospheric Pollutants Upon Disease Susceptibility in Chickens and Quail  
 Parasitic, Bacterial, Virus, and Fungus Diseases of Poultry  
 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

### Management

Condemned Poultry Products and Hatchery Management  
 Paper Mill By-Products, a Source of Litter for Broilers  
 Development of An Electric Automatic Beak Remover  
 Relationships of Certain Poultry Practices to the Avian Leukosis Complex (Marek's Disease and Lymphoid Leukosis)  
 Socio-Economic Factors Involved in Broiler Production  
 Reproductive Performance of Artificially Inseminated Broiler Breeders Maintained in Cages  
 Selected Environmental Factors on Feathering, Skin Lesions, and Growth of Broilers

### Breeding

Genetics of Egg Production Under Less than Normal Day Length  
 Reproductive Performance of Artificially Inseminated Broiler Breeders Maintained in Cages  
 Genetic Bases for Avian Leukosis Complex Resistance

### Environment

Selected Environmental Factors on Feathering, Skin Lesions, and Growth of Broilers  
 Responses of Chickens to Variations in Air Temperature, Humidity, and Velocity  
 Effect of Atmospheric Pollutants Upon Disease Susceptibility in Chickens and Quail

### Nutrition

Selenium and Vitamin E Functions in Poultry  
 Cholesterol Study

### Pesticides

Pesticide Residue Studies

### Feeding

Livestock Waste as Animal Feed

## RESEARCH DATA ANALYSIS

### Statistics

Development and Maintenance of Statistical Analysis System

## ZOOLOGY-ENTOMOLOGY

### Pest Control

Apple Insects  
 Feasibility of an Integrated Cotton Insect Control Program  
 Biology, Ecology, and Control of Forest and Shade Tree Insects  
 Evaluation of Aldicarb as a Suppression Tool for Inclusion in Boll Weevil Eradication Programs  
 Biological Control of Insects and Other Arthropod Pests  
 Biology and Control of Woody Ornamental Insects and Mites  
 Biology and Control of Insect Pests of Cotton  
 Biology and Control of Insects on Soybeans  
 Biochemistry and Physiology of Insect and Tick Pheromones  
 Ecology and Control of Blood-Sucking Flies  
 Bionomics and Control of Corn Insects in Alabama  
 Biology and Control of Insects and Mites of Pecans  
 Bionomics and Control of the Pecan Weevil  
 Vegetable Insects Research  
 Identification, Biology, and Control of Scale Insects on Ornamental and Forest Plants  
 Biology and Control of Peanut Insects  
 Site and Factors Affecting Boll Weevil Sex Pheromone Production  
 Insect Enemies of Bark Beetles Infesting Southern Pines

### Wildlife Management

Ecological Studies of Wild Turkeys  
 Furbearer and Mammalian Predator Studies  
 Physiology of Reproduction in Wild Turkey  
 Wild Turkey Management Investigations in Alabama  
 Biology, Ecology, and Management of the White Tailed Deer  
 Woodcock Studies  
 Research on Feral Dogs in Alabama  
 Reclamation of Strip-Mined Lands  
 Effect of Clear Cutting on Wildlife Food Production  
 Beaver Pond Management  
 Miscellaneous Wildlife Studies  
 Bobwhite Quail Studies

### Ecology

Reptiles and Amphibians of Alabama  
 The Hydradephaga (Aquatic Beetles of Alabama)  
 Ecologic Impacts of Wading Birds on Aquatic Environment  
 Reclamation of Strip-Mined Lands in Alabama

### Breeding

Physiology of Reproduction in Wild Turkey

### Pesticides

Influence of Formulation and Application Conditions on the Persistence and Residues of Pesticides

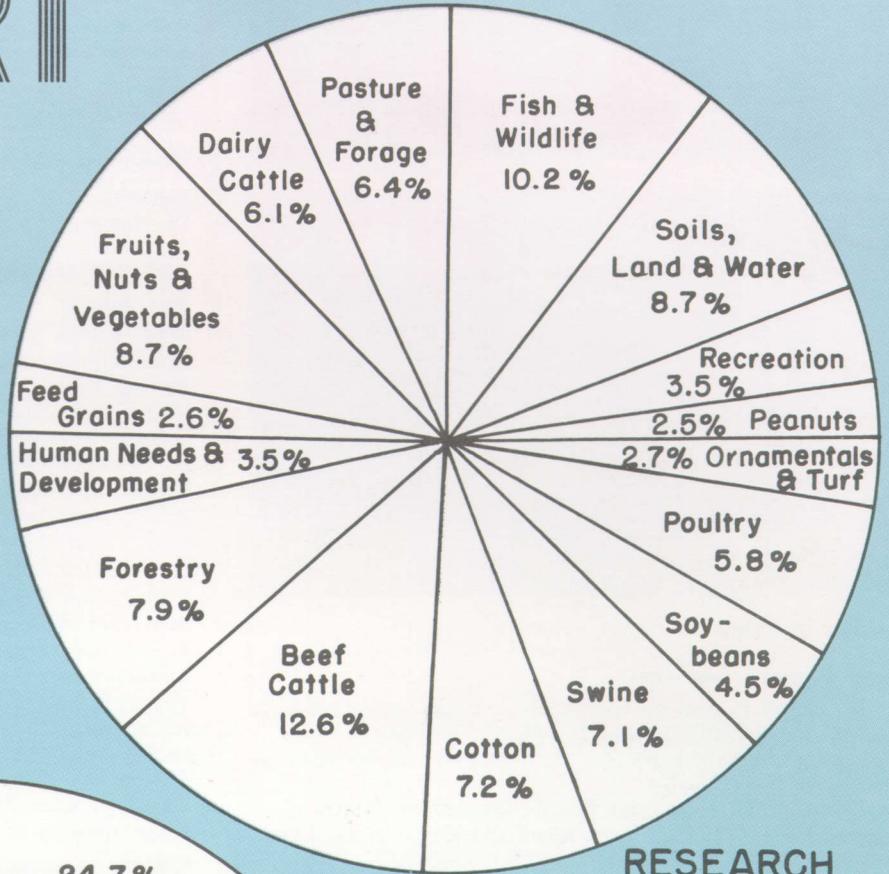
### Cotton Production

Influence of Cultural Practices on Short-Season Cotton

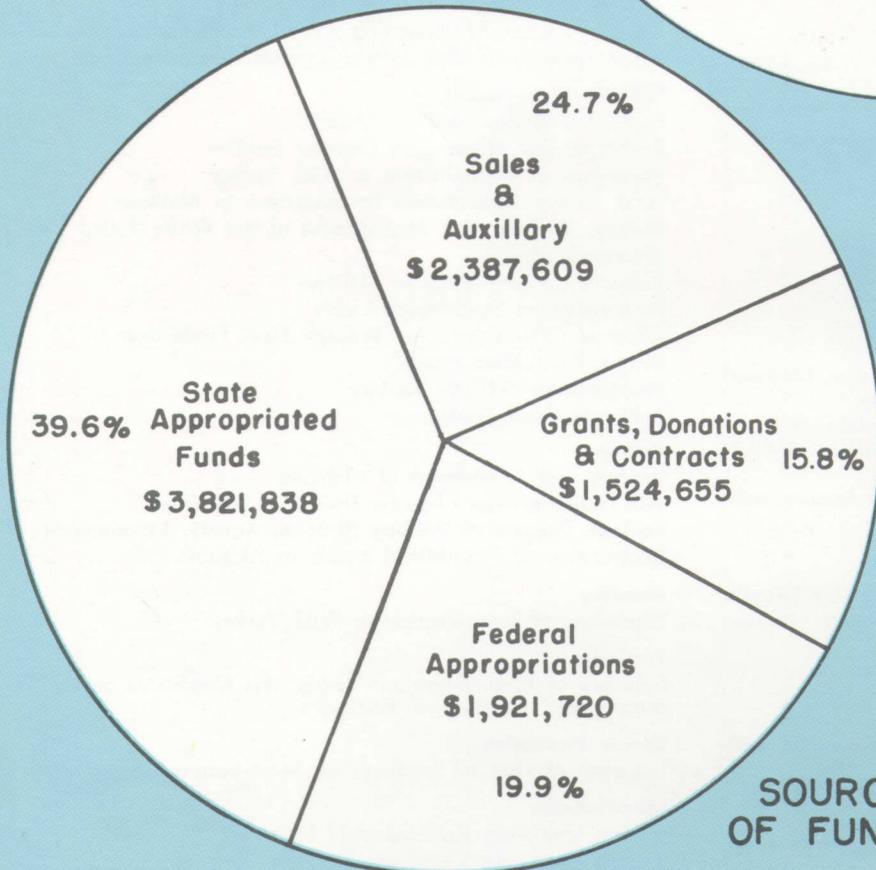
### Miscellaneous

Auburn University Entomological Museum  
 Auburn University Vertebrate Museum

# FINANCIAL REPORT



RESEARCH EXPENDITURES



SOURCE OF FUNDS



# Spreading the Word

Research results are valuable only if they get to the people who can use the information, and research reporting received added emphasis during the year. Methods of dissemination included printing and distributing Experiment Station publications, preparation and release of stories to the mass media (newspapers, magazines, radio, television), technical articles published in professional journals, and numerous programs held at the Experiment Station.

Experiment Station publications produced during the year totaled 42 individual reports, with 130,000 copies. These were widely distributed to members of Alabama's agricultural and business community, as well as to selected groups in other states and many foreign countries. Faculty members

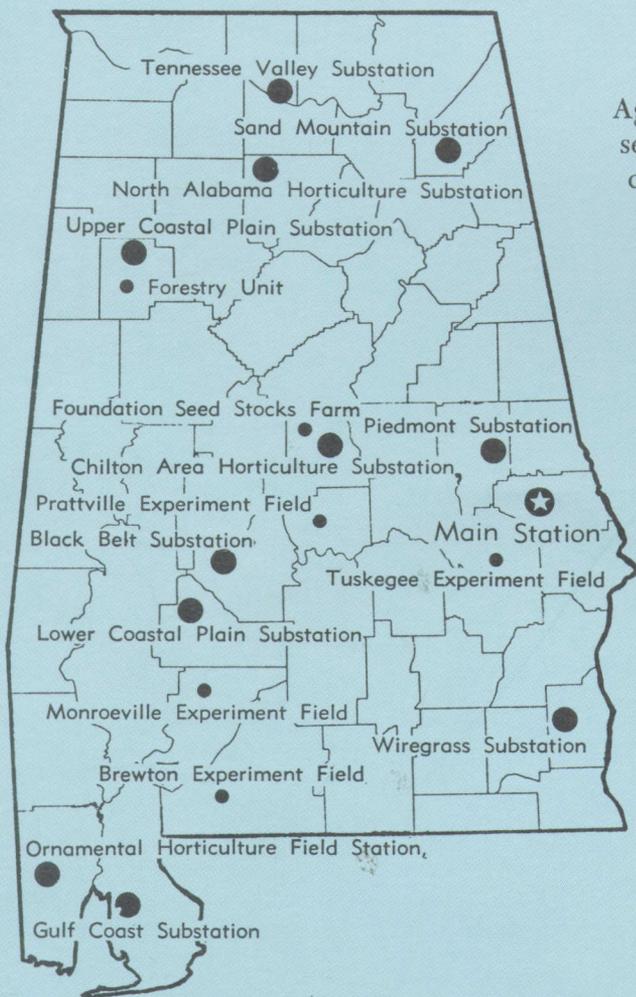
had 236 technical articles published in professional journals.

Some 300 releases were distributed to newspapers, magazines, and specialty publications, which brought attention of a wide variety of readers to efforts and accomplishments of Auburn agricultural research. Many of these stories reported results of research in progress, some even before the first year was completed, giving users the benefit of such information as early as possible.

A total of 34 field day programs, area meetings, and other commodity group conferences held at outlying units during the year brought thousands of visitors to the Agricultural Experiment Station. Such sessions allowed face-to-face discussions between researchers and users of research data.



# Agricultural Experiment Station System Puts Auburn Research Near All Alabamians



With 21 outlying units located throughout the State, the Agricultural Experiment Station System makes Auburn research a neighbor to all Alabamians. These strategically located research units complement research of the Main Station at Auburn, making the overall program more oriented to problems that may be peculiar to each specific area of the State.

The substations, fields, and specialized units were located so that each major soil area had a research unit. This equipped the Experiment Station to better serve the needs of field crops, livestock, forestry, and horticultural producers in each region in Alabama. The record of service over the years testifies to the soundness of this approach.

There was never any doubt that improving efficiency of producing and handling farm products served all the people. Attention to non-agricultural problems has been intensified in recent years with extra efforts given to environmental protection, recreation, health and safety, and other areas of public concern. The combination of Main Station and outlying units continues to provide the organization and facilities needed for attacking modern day problems of both rural and urban people.