

Seventy-First

ANNUAL REPORT

1958

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OF THE
TENNESSEE AGRICULTURAL
EXPERIMENT STATION

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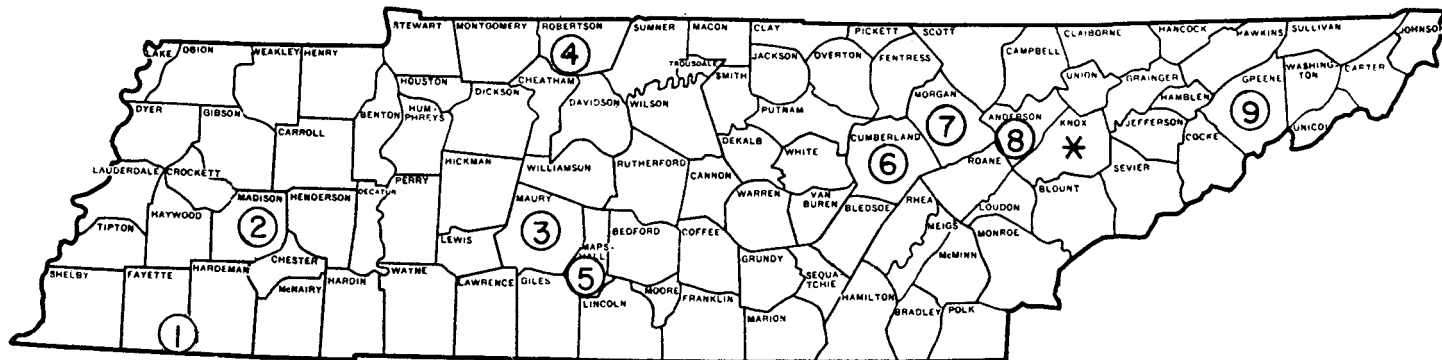
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THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Research Centers

University of Tennessee Agricultural Experiment Station



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| <ul style="list-style-type: none"> * Main Station 1 Ames Plantation 2 West Tennessee Experiment Station 3 Middle Tennessee Experiment Station 4 Highland Rim Experiment Station | <ul style="list-style-type: none"> 5 Dairy Experiment Station 6 Plateau Experiment Station 7 Forestry Experiment Station 8 U-T AEC Agricultural Research Laboratory 9 Tobacco Experiment Station |
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SEVENTY-FIRST
ANNUAL REPORT
1958

Tennessee Agricultural Experiment Station



C. E. Brehm . . . President of the University
Webster Pendergrass Dean of Agriculture
John A. Ewing Director
Eric Winters Associate Director
Florence L. MacLeod, Assistant Director,
Home Economics Research



THE UNIVERSITY OF TENNESSEE
KNOXVILLE

LETTER OF TRANSMITTAL

Knoxville, Tennessee
January 1, 1959

To His Excellency, Frank G. Clement,
Governor of Tennessee

SIR: I have the honor of transmitting herewith, on behalf of the Board of Trustees of the University of Tennessee, a report of the work and expenditures of the Agricultural Experiment Station for the year 1958.

This report is submitted in accordance with the law requiring that such a report be submitted annually by the administrators of the Experiment Station to the Governor of the State.

Respectfully submitted,
C. E. Brehm, President

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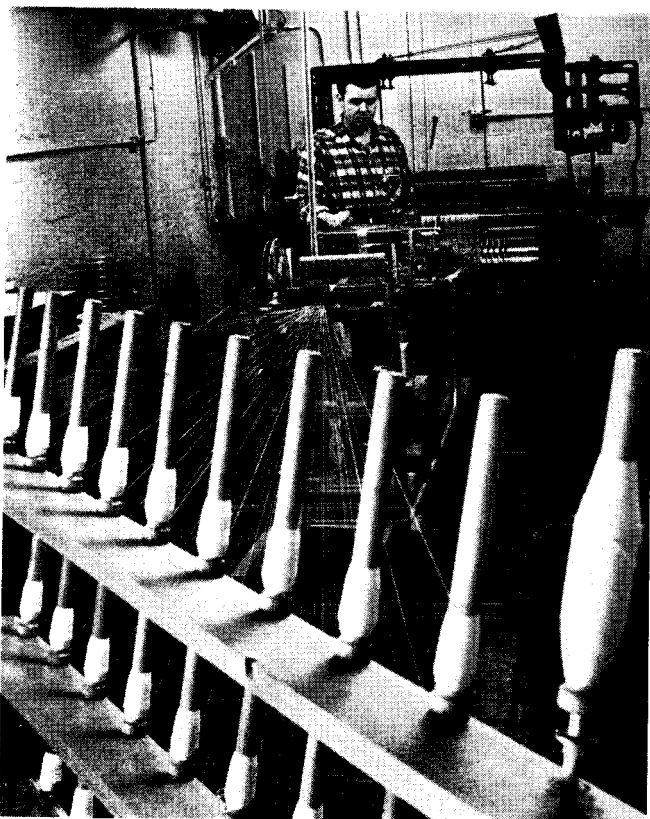
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FOREWORD

Tennessee agriculture has developed and advanced mostly through the application of research findings. For example, the higher crop yields and improved crop quality of today were made possible by past research on crop breeding, fertilization, and pest control. Increased livestock production has come about partly because of better quality and larger quantity of feeds produced; in addition, past research has made possible improved livestock management practices.

Research now underway and planned should help Tennessee to advance still further agriculturally. Here are three important examples where expanded research activities are needed badly:

a) **Cotton.** This is Tennessee's Number 1 cash crop. More



COTTON RESEARCH

—The operator stands before the miniature slasher, which is used to prepare warp beams for the loom—shown in the background—from very small samples of cotton. These cotton samples weigh about 5 pounds each.

The yarns are pulled from the creel, foreground, and pass through a sizing solution that contains starch, gums, and lubricants. The yarn sheet is then squeezed, dried, and wound on a section beam in layers 1 inch wide. Twenty of these beams are combined on the loom to form the warp of the woven material. The woven cotton cloth is subjected to further testing in the Home Economics cloth testing laboratory. The small slasher was built in the Physics shop at the University of Tennessee.

research work is needed on cultural practices, including mechanization and fertilization. Improved varieties also need to be developed.

b) **Soybeans.** This relatively new cash crop already accounts for \$10 million annual income to Tennessee farmers. More information is needed on cultural practices—especially proper fertilization. Breeders should develop better-adapted varieties.

c) **Forestry.** About half of Tennessee's land area is in forest. Improved hybrid varieties of forest trees should be possible through a tree-breeding program. Nearly 9,000 acres of forest land in Morgan and Scott counties is owned by the Experiment Station, but more facilities are needed. Tennessee's \$100 million annual return from forestry could be doubled.

Scope of the Research Program

Solves Problems. Research at the Tennessee Agricultural Experiment Station is geared to solve problems that confront owners and operators of farms, rural homemakers, rural organizations, industry serving agriculture, extension workers, vocational agriculture teachers, Soil Conservation Service workers, and farm leaders who are concerned with future developments. The workers of the Agricultural Experiment Station carry on studies to discover new facts, and to develop new principles, new methods, new materials, new procedures, better plant varieties, and better breeds of animals. The results of these studies have repaid agriculture many times the funds provided from both public and private sources.

Basic Research. The research of the Experiment Station is carried out under more than 150 formal research projects. Some projects involve work that is "basic" or "fundamental" in character. "Basic research" is the search for new knowledge and understanding of why and how things occur and behave as they do. Basic knowledge provides ideas and guidance for "applied research."

Applied Research. Much project work can be classed as "applied research." In the past, applied research has been related largely to production techniques, and this continues to be a very important field of work. However, marketing research has been expanded in the past few years and more processing and utilization of applied research studies probably will be conducted in the future.

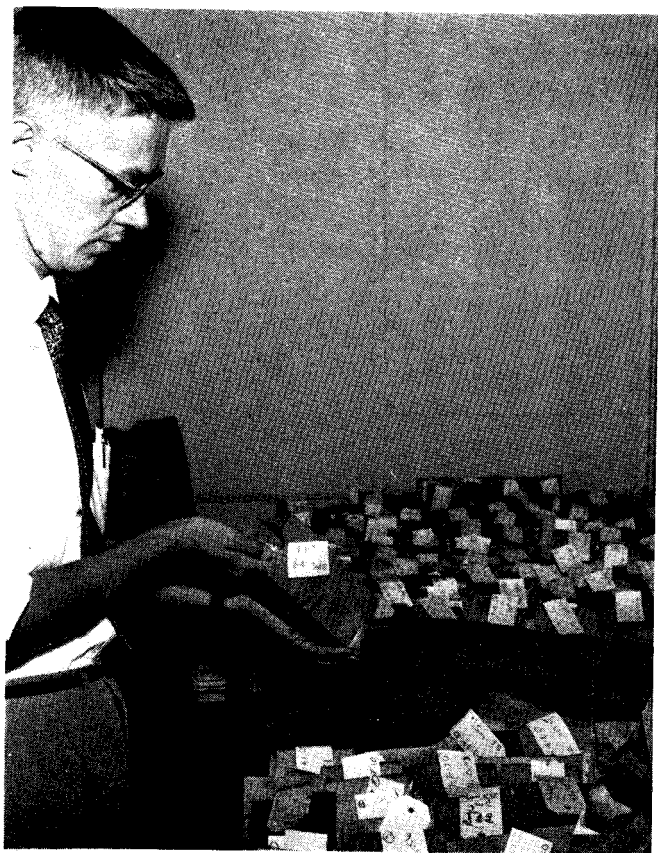
Research Project Results

The scope of the research program can probably be best illustrated by the following brief summaries of results from a few representative projects:

Research With Farm Crops

Cotton quality measurement is becoming more important because manufacture of many new and improved fabrics demands more rigid fiber requirements. Instruments developed at Tennessee to test length, strength, and fineness are being more widely used. Work underway on these instruments promises modifications that will simplify their operation and increase their accuracy, and further improve marketing operations for Tennessee's Number 1 crop.

Two burley tobacco varieties resistant to Black Shank—



SOYBEAN RESEARCH

—For every new and improved variety of soybeans that is released, hundreds of experimental varieties must be bred individually, tested, and kept pure for 8 to 12 years, or until the soybean breeder is satisfied that the new variety is worthy of release.

T. S. Osborne, plant breeder on the University of Tennessee Agricultural Experiment Station staff, is shown examining seeds of several thousand strains of experimental, irradiated soybeans—all coded as to performance ability. Many of these strains will be discarded within a year or two because the soybean plants lack in yield or standing ability, or because the beans are low in protein or oil content.

Burley 11A and Burley 11B—were released in 1954. Burley 21, resistant to wildfire as well as to mosaic and black root rot, was released in 1955. Burley 21 is now widely grown in all burley areas. These varieties were developed at Tennessee in cooperation with the U.S.D.A., and are continuing to bring increased wealth to the state.

Dixie 29, developed in cooperation with U.S.D.A., was released in 1954. It has had the highest average yield of commercially available hybrids entered in the state variety tests. Naturally high-yielding crops go hand-in-hand with today's accent on improved cultural practices and the resulting increased efficiency of production and low cost foods at the food stores.

Holston Barley was released in 1958. It has good yield and is superior to other barleys adapted to Tennessee in disease and lodging resistance. Development of this feed grain for Tennessee broadens the number of such grains farmers in the state can grow.

Alfalfa yields have been larger, and the stand has persisted longer where liberal amounts of lime and potash have been used in addition to phosphate and borax. In one experiment there is still an excellent stand on the treatment which received enough lime to make the soil neutral. However, on the treatment where the soil is slightly acid, the stand is getting thin and yields are lower. Both treatments included the same high rate of potash. Cultural practices that result in higher production of alfalfa in Tennessee will add to the State's livestock income.

Standard pear varieties are seriously injured by fireblight disease in Tennessee. Pears resistant to this disease have been developed at Tennessee over a period of years. Four resistant varieties have now been made available to growers, who in turn can now begin to recapture part of the local pear market.

Marketing and Management Research

What total farm investment is needed to produce a labor income of \$3,500? An answer to this question for West Tennessee has been made possible by a study of costs and returns on representative farms in the cotton-producing area. For a livestock-cotton farming system, \$30,000 would be required, whereas for a grade A dairy system \$25,000 is the sum needed. Such data are valuable to banks and to land owners who wish to convert former cotton acreage to other productive farm enterprises.

Many owners of forest-lands in Tennessee could increase their income by changing their timber marketing practices. A study in three representative counties indicated, for example, that owners who obtained three or more bids on salable timber sold as stumpage received prices that were 33 percent higher than producers who obtained only one bid. Knowledge of this by farmers can increase their woodland incomes by a third and perhaps encourage them to give their forested areas better care—resulting in some increase in Tennessee's total income from agriculture.

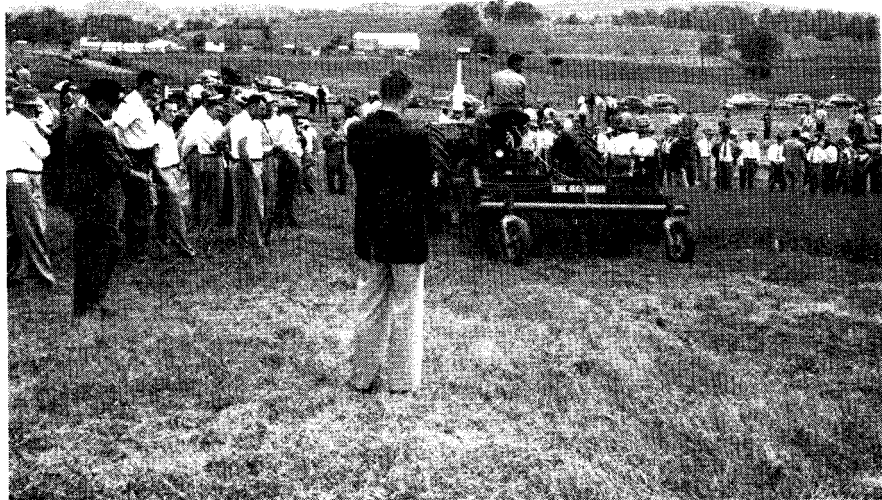


FORESTRY RE-SEARCH—A Forestry Field Day was held at the University of Tennessee's Bryn Mawr Forest near Wartburg in 1958. Here two touring groups examine some of the experimental work that is being carried on. The farm forests of Tennessee could greatly increase agricultural income if they were properly managed. Total return from forestry in the state is already \$100 million, and new forest industries could help double that figure in the future.

Better quality frozen strawberries at lower cost are possible with the strawberry capper which was developed at Tennessee and which is now in commercial production. Tests show the machine can handle 1,500-2,000 pounds of berries per hour and remove over 90 percent of the caps, or the green calyx at the base of the berry. Ordinarily the caps are removed in the field by the picker. Many berries are injured, and the rate of picking is 30 percent slower than when berries are picked with caps. Injured berries deteriorate considerably in transit, lowering over-all product quality. The lower

cost of picking berries with caps more than compensates for the cost of machine capping, and at the same time results in a more attractive, more salable product.

Tennessee offers significant cost advantages to evaporated milk producers. It was found that during 1948-56, the price per pound of butterfat averaged 82 cents at evaporated milk plants in Tennessee, 95 cents in Wisconsin, and 96 cents in California. At the same time wholesale prices for evaporated milk averaged 13 cents per case higher in the South Central Region than in the East North Central Region. Thus, plants located in Tennessee would



FIELD DAY EVENTS—Most brands of hay and silage harvesting machines were represented in a forage harvesting demonstration at the East Tennessee Farmers Convention. These demonstrations were in addition to the tours of livestock, poultry, and crop experiments.

have averaged a net advantage of 47 cents per case of evaporated milk over plants located in the East North Central Region as far as these two factors are concerned. This finding could result in milk marketing imbalances being corrected.

The army worm over-winters in Tennessee, it has been found. The origin of serious army worm attacks is therefore local, rather than from moths which fly or are carried in by wind from the South. This information will be helpful in effectively controlling army worm attacks in the state.

Research With Livestock and Poultry

Identical twin heifers are being used to increase accuracy and efficiency of dairy nutrition research. It has been found at Tennessee that over-liberal feeding of young heifers results in significantly lower—rather than higher—milk production during both the first and second lactation periods. Had the study been made with heifers from single births, many more animals would have been required to make sure that the results were due to level of feeding rather than to differences in the heredity of the animals. Thus an important research finding was obtained at low investment in animals.

How are reproductive activities of large animals affected by radiation? This is a question of great interest in the atomic age. Studies with beef cattle indicate that bulls did not become sterile until 6 weeks after irradiation (with 200 r from Co⁶⁰). Sperm number and quality gradually increased after the 16th week, and gross recovery occurred at 6 months.

Calves from cows irradiated during the last third of pregnancy were about as large at weaning as were calves from non-irradiated cows. However, the testes of the male calves from irradiated cows were only half as large as those from the control group.

Salmonella organisms—the paratyphoid group—infect nearly all animals, including poultry and man. University of Tennessee poultry scientists found that hens infected with paratyphoid organisms did not produce contaminated eggs. Contamination of the egg shell was found, however, which probably occurred during or after the egg was laid. This link of knowledge should help science improve control of this troublesome and costly disease.

Planning and Operating

A Pilot Farm on the Ames Plantation

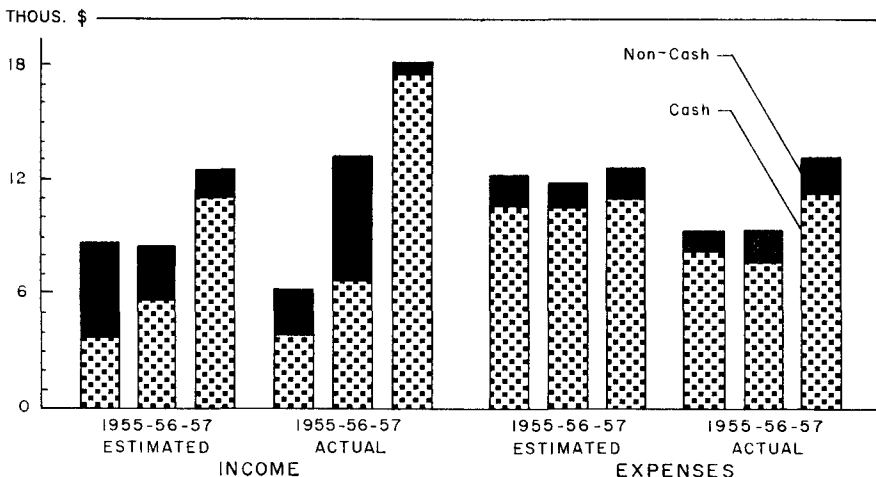
In late 1954 it was decided to develop a Pilot Farm on the Ames Plantation. This is in the Brown Loam area, a major cotton-producing area of Tennessee. The Pilot Farm was set up to demonstrate capital needs for converting a low income cotton farm into a well-balanced farming system over about a 3-year period.

A 310-acre tract of land was selected for this farm. During 1953, this two-man operation grossed \$4,440—90 percent of which

was from cotton. Net cash income averaged \$498 per man. Investment totaled \$15,500.

Between January 1955 and December 1957, about \$63,000 was invested in this farm, including the value of the land. This included about \$12,000 in operating funds to provide lime, fertilizer, wages of two men, and other similar items needed to convert this farm to a cotton-hog-beef-forestry system of farming.

The additional investment of \$63,000 and improved management resulted in increasing net income per man from \$498 to \$3,500 within a 4-year period. A comparison of estimated and actual income and expenses on this farm for the period 1955-57 is shown in the chart.



Financial Statement

THE UNIVERSITY OF TENNESSEE AGRICULTURAL EXPERIMENT STATION

In Account With

The United States Appropriation under the Hatch Act Amended
and Non-Federal Funds, 1957-58.

	HATCH	TITLE II	Non-Federal Funds
Receipts			
From United States Treasurer	\$826,615.00	\$ 2,500.00	
From Other Sources			\$1,042,506.39
Expenditures			
Personal Service	680,326.57	319.20	549,758.18
Travel	26,573.04	25.00	22,379.87
Transportation of Things	612.00	26.22	3,489.65
Communication Service	468.59	7.28	14,744.75
Rents and Utility Services	3,506.57		20,431.96
Printing and Binding	2,598.77		16,639.03
Other Contractual Services	14,390.12		75,874.34
Supplies and Materials	67,710.45	2,122.30	189,407.87
Equipment	16,287.61		56,291.30
Land and Structures (Contractual)	14,141.28		93,489.44
Total Expenditures	\$826,615.00	\$ 2,500.00	\$1,042,506.39

Agricultural Economics and Rural Sociology

Proj. No.	Research Project Titles
Hatch 1	Farm Organization in Particular Type of Farming Areas.
Hatch 2	Farmers' Financial Problems in Tennessee.
Hatch 4	Farmers' Capital Needs and Problems of Capital Acquisition.
Hatch 5	Farming Adjustments in Tennessee with Emphasis on Economics of Conservation Farming; cooperative with the U. S. Department of Agriculture and TVA.
Hatch 6	Impact of Industrial Development upon Tennessee's Agriculture.

- Hatch 7 Labor Requirements and Supply on Tennessee Farms.
- Hatch 10 Marketing Livestock in Tennessee; cooperative with the U. S. Department of Agriculture (contributing to Regional Project SM-7).
- Hatch 11 Economics of Marketing Milk in Tennessee; cooperative with the U. S. Department of Agriculture.
- Hatch 12 Type and Breed as Factors Influencing Beef Carcass Characteristics and Consumer Acceptance; cooperative with the Department of Animal Husbandry-Veterinary Science.
- Hatch 13 A Study of the Marketing Methods of the Horticultural Specialty Industry in Tennessee; cooperative with the Department of Horticulture and U. S. Department of Agriculture (contributing to Regional Project SM-12).
- Hatch 16 Marketing Forest Products—Practices of First Buyers and Producers of Forest Products in Tennessee.
- Hatch 17 A study of Comparative Prices Paid Producers for Milk of Manufacturing Grade in Tennessee and the Midwest.
- Hatch 18 An Economic Analysis of the Effects of Fires on Insurance and Other Costs at Gins in Tennessee (contributing to Regional Project SM-17).
- Hatch 19 Financial Management and Related Problems Affecting the Success of Tennessee Cooperatives.
- Hatch 20 Improving the Usefulness of Livestock Marketing Information (contributing to Regional Project SM-20).
- Hatch 21 Economic Analysis and Evaluation of the Use of Fiber Tests in the Marketing of Cotton; cooperative with the U. S. Department of Agriculture (contributing to Regional Project SM-18).
- Hatch 22 An Economic Study of Feed and Forage Production and Use on Beef and Dairy Farms in Specified

Areas of Tennessee (contributing to Regional Project S-27).

- Hatch 23 Buying Policies and Other Practices in the Tennessee Vegetable Industry; cooperative with the Department of Horticulture (contributing to Regional Project SM-8).
- Hatch 24 Expansion of Demand for Horticultural Specialties; cooperative with the Department of Horticulture.
- Hatch 25 Analysis of Tennessee Watershed Projects Established Under U. S. Public Law 566 and Tennessee Public Chapter No. 112; cooperative with the U. S. Department of Agriculture.
- Hatch 156 Fluid Milk Supplies, Prices and Movement in the Lower Mississippi River Valley Marketing Area (contributing to Regional Project SM-10).
- Hatch 166 Evaluation of Consumer Acceptance of Broilers of Various Degree of Skin Pigmentation (contributing to Regional Project SM-15).
- Hatch 171 A Survey of Professional Attitudes Toward, Definition of, and Methods Used in Farm and Home Development in Tennessee.
- Hatch 179 An Economic Appraisal of Farming Adjustment Opportunities in Selected Areas of Tennessee to meet Changing Conditions; cooperative with the U. S. Department of Agriculture and TVA (contributing to Regional Project S-42).

Projects Concluded in 1958

- Hatch 3 A Study of Rural Community Organizations as They Affect the Diffusion of Information on, and the Adoption of, New Farming and Homemaking Techniques.
- Hatch 9 Buying Policies and Other Practices of Vegetable Marketing Organizations in Tennessee (contributing to Regional Project SM-8).
- Hatch 14 To Appraise the Effects of Various Factors on the Demand for Poultry and Poultry Products (contributing to Regional Project SM-15).

- Hatch 15 The Effect of Price, Price Relationships, Selected Population Characteristics and Incomes, on Fluid Milk Utilization (contributing to Regional Project SM-10).
- State A Study of the Costs and Margins Involved in the Manufacture and Marketing of Cheddar Cheese.

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Situation and Outlook on Small Scale Farms as Indicated by the Agricultural Situation in Grainger County, Tennessee, Fall of 1958. Tenn. Farm & Home Sci., Progress Report No. 28, Dec., 1958.

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Sci., Progress Report No. 25, March, 1958.

Cole, J. W. and Badenhop, M. B.

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Martin, Joe A.

Off-Farm Migration: Some of Its Characteristics and Effects upon Agriculture in Weakley County, Tennessee. Tenn. Agric. Expt. Sta. Bul. 290, Sept., 1958.

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Returns from Selected Dairy Herds in the Nashville Milkshed. Tenn. Agric. Expt. Sta. Bul. 281, Jan., 1958.

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Factors Affecting Per Capita Consumption of Broilers in Tennessee. Tenn. Agric. Expt. Sta. Bul. 288, Aug., 1958.

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Agricultural Engineering

Proj. No.	Research Project Titles
Hatch 26	Food Processing Machine Development.
Hatch 27	Investigations in Structure and Mechanical Equipment for Storing, Drying and Handling Hay.
Hatch 31	Investigations in the Improvement of Sprayers and Non-Solid Fertilizer Distributors.
Hatch 32	Chemical Weed Control; cooperative with the Agronomy and Horticulture Departments.
Hatch 169	Storage and Management of Water for Irrigation.
Hatch 172	Housing for Chicks; cooperative with the Poultry Department.
State 6	Mechanical Handling of Silage.
State 7	Electric Treatment of Plant Materials.

Projects Concluded in 1958

Hatch 29	Harvesting and Processing of Grass and Legume Seeds Under Southern Conditions.
Hatch 30	New Type Concrete Block for Building a Farm House (contributing to Regional Project S-8).

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Arnold, H. A.

Agricultural Engineers Develop Another Type of Mechanical Roughage Feeder. Tenn. Farm & Home Sci., Progress Report No. 27, Sept., 1958.

Agronomy

Proj. No.	Research Project Titles
Hatch 28	Moisture Sorption Characteristics of the Major Soils of Tennessee and the Relation of Moisture Tensions to Plant Growth and Fertilizer Utilization; cooperative with the U. S. Department of Agriculture and TVA (contributing to Regional Project S-24).
Hatch 32	Chemical Weed Control; cooperative with the Agricultural Engineering and Horticulture Departments.
Hatch 33	Evaluation of the Performance of Varieties of Field Crops.
Hatch 34	Corn Improvement; cooperative with the U. S. Department of Agriculture.
Hatch 35	Conservation of Organic Matter in the Soil as Affected by Degree of Neutralization (Liming).
Hatch 36	Nutrient Phosphorus Value of Rock Phosphate to Various Plants Under Various Soil Treatments, Such as Organic Matter.
Hatch 37	Production of Burley Tobacco; cooperative with the U. S. Department of Agriculture.
Hatch 38	The Comparative Value and Relative Efficiency of Various Phosphate Fertilizers Under Different Soil and Cropping Conditions; cooperative with TVA.
Hatch 39	Improvement of Cultivated Grasses.
Hatch 41	The Effects of Subsoiling, in Addition to Ordinary Plowing and Disking, on Crop Yields and Moisture and Organic Matter Content of the Soil.
Hatch 42	Potassium Fertilization of Farm Crops on Different Soil Series in Tennessee.

- Hatch 44 A Study of the Poisoning of Cattle Pastured on Fescue.
- Hatch 45 Movement and Persistence of Herbicides in the Soil (contributing to Regional Project S-18).
- Hatch 46 The Effects of Various Management Variables on the Establishment and Development of Orchard-grass, Tall Fescue, White Clover, and Alfalfa (contributing to Regional Project S-12).
- Hatch 47 The Establishment and Maintenance of Turf.
- Hatch 48 Soil Survey of Tennessee to Help Determine Crop Adaptations and Management Requirements; cooperative with the U. S. Department of Agriculture and TVA.
- Hatch 49 Determination of Residues from Certain Pesticides When Applied for the Normal and Experimental Control of Insects and Diseases of Fruits and Forage Crops in Tennessee; cooperative with the Entomology Department (contributing to Regional Project S-22).
- Hatch 50 The Effects of Certain Atmospheric Effluents Upon the Growth and Composition of Plants, and Upon Animal Life, at Locales in East and Central Tennessee; cooperative with the Department of Animal Husbandry-Veterinary Science.
- Hatch 51 Root Development of Farm Crops as Related to the Physical and Chemical Characteristics of the Soil; cooperative with TVA.
- Hatch 52 The Evaluation of Different Pasture Species in Various Combinations and at Varying Rates of Nitrogen Fertilization as Reflected in Beef Cattle Gains and Forage Yields; cooperative with the Department of Animal Husbandry-Veterinary Science.
- Hatch 54 Effect of Certain Insecticides and Herbicides Upon the Biochemical Activities of the Soil and Upon Plant Growth.
- Hatch 55 The Influence of Chemical, Physical, and Mineralogical Properties of Soils on Nutrient Availability and Plant Growth (contributing to Regional Project S-14).

- Hatch 56 Trace Elements in Tennessee Agricultural Crops.
- Hatch 57 Evaluation of New Plants; cooperative with the Department of Horticulture (contributing to Regional Project S-9).
- Hatch 163 Culture of Dark Tobacco.
- Hatch 164 Nitrogen Fertilization of Farm Crops.
- State 3 Effects of Fluorine Levels of Soil and Water on Grazing Cattle Under Different Systems of Management; cooperative with the Department of Animal Husbandry-Veterinary Science.

Projects Concluded in 1958

- Hatch 40 Pasture Fertilization and Forage Quality Studies.

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Agronomy Committee

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The Inheritance of Petal Spot in Kenaf, *Hibiscus cannabinus*

- Hatch 50 The Effects of Certain Atmospheric Effluents Upon the Growth and Composition of Plants, and Upon Animal Life, at Locales in East and Central Tennessee; cooperative with the Department of Agronomy.
- Hatch 52 The Evaluation of Different Pasture Species in Various Combinations and at Varying Rates of Nitrogen Fertilization as Reflected in Beef Cattle Gains and Forage Yields; cooperative with the Department of Agronomy.
- Hatch 58 Studies of Endocrine Relationships in Farm Animals—Swine.
- Hatch 60 Studies of Endocrine Relationships in Farm Animals—Beef Cattle.
- Hatch 61 The Improvement of the Producing Ability of Beef Cattle; cooperative with the U. S. Department of Agriculture (contributing to Regional Project S-10).
- Hatch 63 Mineral Metabolism in Animals: I. Absorption, Distribution, and Physiological Behavior of Calcium and Phosphorus in Farm Animals; cooperative with AEC.
- Hatch 64 Mineral Metabolism in Animals: II. Interrelationships of Calcium and Phosphorus with Vitamins, Minerals, Hormones, and Other Factors; cooperative with AEC.
- Hatch 65 The Detection of Animals Heterozygous for Recessive Bovine Dwarfism; cooperative with the U. S. Department of Agriculture.
- Hatch 66 The Effects of Radiation on Reproductive Physiology in Farm Animals; cooperative with AEC.
- Hatch 67 Ripening of Beef from Cattle Produced Under Different Feeding Methods as Related to Palatability, Tenderness, and B-Vitamin Content; cooperative with the College of Home Economics.
- Hatch 68 Carcass Value Investigations with Beef.
- Hatch 69 Expanded Study and Evaluation of Diagnostic Measures in *Vibrio* Fetus Infection of Cattle and

Sheep (contributing to Regional Project S-30).

- Hatch 70 Evaluation of the Adaptability of Existing Breeds and Commercial Types of Sheep for the Production of Early Milk Fat Lambs (contributing to Regional Project S-29).
- Hatch 71 Factors Affecting Feed Utilization by Ruminants.
- Hatch 72 Evaluation of Roughages for Beef Cattle.
- Hatch 73 The Improvement of the Producing Ability of Swine Through Performance Testing and Breeding Methods.
- Hatch 74 Evaluation of Control Measures Against Anaplasmosis; cooperative with the U. S. Department of Agriculture and Tennessee Department of Agriculture.
- Hatch 176 Performance of Growing-Finishing Swine on Concrete and Pasture.
- State 2 Swine Testing.
- State 3 Effects of Fluorine Levels of Soil and Water on Grazing Cattle Under Different Systems of Management; cooperative with the Department of Agronomy.

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Hatch 75	Breeding and Genetics of Crimson Clover.
Hatch 77	Breeding and Genetics of Lespedezas.
Hatch 78	Use of Ionizing Radiations in Crop Improvement; cooperative with AEC.
Hatch 79	Production and Improvement of Cotton Varieties Suitable to Tennessee Conditions.
Hatch 80	Oat Breeding.
Hatch 81	Barley Breeding.
Hatch 136	Breeding for Improvement in Wheat Varieties to Include Resistance to Disease, Hessian Fly, and Morphological Characters; cooperative with the Entomology and Plant Pathology Departments and the U. S. Department of Agriculture.

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Hatch 85	Factors Affecting Technology, Quality, and Consumer Opinions of Colloid-Treated Strawberries Preserved by Freezing.
Hatch 86	Quality of Frozen Green Snap Beans as Affected by Methods of Transportation, Processing, Duration and Temperature of Storage; cooperative with the Department of Bacteriology.
Hatch 173	Group D Streptococci Isolated from Plants.
ES 385	Relative Costs and Effects on Quality and Market Value of Hand-Capping and Machine-Capping of Strawberries for Processing.

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Hatch 92	Development of Strains of Dairy Cattle Especially Adapted to Southern Conditions; cooperative with the U. S. Department of Agriculture (contributing to Regional Project S-3).
Hatch 93 (Rev.)	Effect of Different Growth Rates and Different Growth Periods Upon the Lactation of Dairy Heifers.
Hatch 95	The Roles and Interrelationships of Sodium, Potassium, Calcium and Phosphorus in Milk Secretion in the Dairy Cow; cooperative with AEC.
Hatch 150	Raising Dairy Calves; cooperative with the U. S. Department of Agriculture.
Hatch 151	Importance of the Dry Period and Management of Dairy Cows During the Dry Period.
Hatch 161	Evaluation of Forages for Dairy Cattle.
Hatch 165	Quality and Shelf Life of Dairy Products in the Marketing Channels.
Hatch 181	Lipolytic Enzymes in Milk.
State 5	The Effects of Feeding Aureomycin as a Supplement to the Ration of Lactating Dairy Cows.

Projects Concluded in 1958

Hatch 90	Elements of a Program to Control Mastitis in Pen-Type Barns.
Hatch 94	To Study the Enzymes in the Milk Secreting Tissue of the Mammary Gland as They Are Related to Cheddar Cheese Ripening.
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Determination of Residues from Certain Pesticides When Applied for Normal and Experimental Control of Insects and Diseases of Fruits and Forage Crops in Tennessee; cooperative with the Department of Agronomy (contributing to Regional Project S-22).

- Hatch 96 A Study of the Insects Attacking Legumes with Special Reference to Alfalfa and Soybeans.
- Hatch 97 A Study of the Life History, Ecology, and Control of Army Worms, **Pseudaletia Unipuncta**, and Related Species (contributing to Regional Project S-25).
- Hatch 98 A Study of the Life History and Means of Control of Insects That Affect the Growth of Cotton.
- Hatch 99 Studies on Soil Insecticides with Special Reference to the Control of the Elongate Flea Beetle, **Systema Elongata**.
- Hatch 100 Evaluation of New Insecticides.
- Hatch 101 A Study of the Life History and Control of the Strawberry Leaf Roller, **Ancylis Comptana**, and Some Related Aspects of Strawberry Insect Control.
- Hatch 136 Breeding for Improvement in Wheat Varieties to Include Resistance to Disease, Hessian Fly, and Changes in Morphological Characters; cooperative with the Botany and Plant Pathology Departments and the U. S. Department of Agriculture.

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Hatch 102	Forest Management.
Hatch 103	A Study of Tree Species Adapted to the Cumberland Mountain Area of Tennessee; cooperative with TVA.
Hatch 105	Stand Conversion Study.
Hatch 106	Forest Tree Improvement, Pine Seed Source Test (contributing to Regional Project S-23).
Hatch 107	Relationship of Soil and Other Site Factors to Forest Composition and Productivity.

Projects Concluded in 1958

Hatch 104	Chemical Debarking of Post Size Hardwood Trees.
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Home Economics

Proj. No.	Research Project Titles
Hatch 67	Ripening of Beef from Cattle Produced Under Different Feeding Methods as Related to Palatability, Tenderness, and B-vitamin Content; cooperative with the Department of Animal Husbandry-Veterinary Science.
Hatch 108	Bone Density Measurements as a Method of Assess-

ing Calcium and Phosphorus Status.

- Hatch 110 The Utilization and Requirements for Calcium, Phosphorus, and Magnesium and Their Interrelationships with Other Nutrients in Preadolescent Children (contributing to Regional Project S-28).
- Hatch 112 The Relationship Between Child Rearing Attitudes of Rural Parents in Tennessee and Selected Behaviors of Their Children.
- Hatch 113 The Effect of Selected Properties of Raw Cotton
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- Hatch 109 Retailing and Family Buying Practices as Related to Purchase of Fruits and Vegetables by Rural Mountain Families (contributing to Regional Project SM-13).
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Hatch 23	Buying Policies and Other Practices in the Tennessee Vegetable Industry; cooperative with the Department of Agricultural Economics and Rural Sociology.
Hatch 24	Expansion of Demand for Horticultural Specialties; cooperative with the Department of Agricultural Economics and Rural Sociology.
Hatch 32	Chemical Weed Control; cooperative with the Agricultural Engineering and Agronomy Departments.
Hatch 57	Evaluation of New Plants; cooperative with the Department of Agronomy (contributing to Regional Project S-9).
Hatch 117	Breeding for Fireblight Resistance.
Hatch 118	A Comparative Study of Inheritance in the Cultivated Raspberry with Reference to Certain Diseases and to Fruiting Habits.
Hatch 119	Breeding and Selection of Blackberries, including Dewberries.
Hatch 121	Inheritance in Garden Beans with Reference to Mexican Bean Beetle and Other Insects, Nematodes, Diseases, Southern Adaptation and Commercial Quality.
Hatch 122	Sweetpotato Improvement.
Hatch 123	Mineral Nutrition of Vegetable Crops.

- Hatch 124 A Study of the Degree of Substitution of Sodium for Potassium as a requirement for Plant Growth and of the Essential Role of Potassium.
- Hatch 125 Mineral Nutrition of Fruit Crops.
- Hatch 126 Vegetable Variety Investigations.
- Hatch 127 Fruit Variety Investigations.
- Hatch 128 Propagation of Fruit and Ornamental Plants.
- Hatch 154 Kind and Variety Investigations of Ornamentals.
- Hatch 157 Management and Evaluation of Plants for Hedges, Screens and Windbreaks.
- Hatch 167 Breeding Tomatoes for Tennessee Markets with Emphasis on Earliness and Disease Resistance; cooperative with the Department of Plant Pathology.
- Hatch 174 Breeding Strawberries for Tennessee Markets with Emphasis on Climatic Adaptability and Disease Resistance; cooperative with the Department of Plant Pathology.

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Hatch 135	Control of Cotton Verticillium Wilt.
Hatch 136	Breeding for Improvement in Wheat Varieties to Include Resistance to Disease, Hessian Fly, and Changes in Morphological Characters; cooperative with the Botany and Entomology Departments and the U. S. Department of Agriculture.
Hatch 137	Root Diseases of Small Cereals and the Nematode Relationship.
Hatch 138	The Utilization of Soil Fumigants and Control of Certain Diseases Incited by Nematodes; cooperative with the U. S. Department of Agriculture (con-

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- Hatch 140 Evaluating New Fungicides.
- Hatch 167 Breeding Tomatoes for Tennessee Markets with Emphasis on Earliness and Disease Resistance; cooperative with the Department of Horticulture.
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- State 4 The Identification and Control of Strawberry Virus Diseases; cooperative with the Tennessee State Department of Agriculture.

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Hatch 147	Relationship of Protein to Energy for Laying Hens.
Hatch 148	Feed Additives for Poultry.
Hatch 155	The Influence of Light Upon Performance of Domestic Chickens.
Hatch 168	Effects of Restricting Feed Intake to Growing Pullets.
Hatch 172	Housing for Chicks; cooperative with the Department of Agricultural Engineering.
Hatch 178	Value of Various Grades of Grains for Poultry.
Hatch 182	Evaluation of Poultry Disease Medicants.
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UT-AEC 4	Mineral Metabolism in Animals: II. Interrelationships of Minerals, Vitamins, Hormones and Other Factors.
UT-AEC 5	Radiation Effects on Reproductive Functions in Farm Animals; cooperative with the Department of Animal Husbandry-Veterinary Science.
UT-AEC 10	External Radiation Studies with Large Animals.
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 S. L. PARKISON, Assistant in Dairy Husbandry
 LANTIS RATCLIFF, Assistant Dairy Husbandman¹, Lewisburg
 J. D. SKEAN, Assistant in Dairy Husbandry
 E. W. SWANSON, Dairy Husbandman
 ROY O. THOMAS, Assistant Dairy Husbandman, Jackson
 L. M. CARPENTER, Assistant in Dairy Husbandry

ENTOMOLOGY

- S. MARCOVITCH, Head of Department
 S. E. BENNETT, Assistant Entomologist
 W. W. STANLEY, Entomologist

FORESTRY

- S. L. BARRACLOUGH, Forester (on leave)
 J. T. BEAVERS, Assistant Forester, Grand Junction
 E. A. HERB, Assistant in Forestry
 J. S. KRING, Forester, Harriman

HOME ECONOMICS

- IDA A. ANDERS, Consultant in Textiles
 MYRA L. BISHOP, Consultant in Home Management
 RUTH BUCKLEY, Consultant in Foods
 MARSHA JAN CRUZE, Assistant in Food Technology
 LORNA J. GASSETT, Associate in Home Management
 SIGRID E. HANSEN, Assistant Textile Chemist
 HAROLD H. HOLLOWAY, Associate in Family Life
 PHYLLIS ILETT, Family Economist
 MARY E. KEISTER, Consultant in Family Life
 FLORENCE L. MacLEOD, Assistant Director, Home Economics Research
 ROSSIE L. MASON, Assistant Human Nutritionist
 BERNADINE MEYER, Food Economist
 ELISE MORRELL, Assistant Human Nutritionist
 MARY E. PURCHASE, Associate in Home Management
 HELEN M. REED, Assistant Family Economist
 PAULA SUE RICHARDSON, Assistant Human Nutritionist
 ELIZABETH J. ROCK, Textile Chemist
 FRANCES A. SCHOFIELD, Human Nutritionist
 H. JUANITA THOMAS, Assistant Food Economist
 CAROLYN A. WERMAN, Assistant Textile Chemist
 DOROTHY E. WILLIAMS, Human Nutritionist

HORTICULTURE

B. S. PICKETT, Head of Department
 JOE S. ALEXANDER, Assistant
 Horticulturist
 GEO. M. CAMPBELL, Assistant Horticulturist
 Jackson
 PAUL COLDITZ, Assistant in Horticulture
 BROOKS D. DRAIN, Horticulturist
 GARY DUREN, Assistant in Horticulture,
 Jackson

T. R. GILMORE, Associate Horticulturist,
 Crossville
 ALICE WHEI-CHU HU, Assistant in
 Horticulture
 W. E. ROEVER, Associate Horticulturist
 A. B. STRAND, Associate Horticulturist,
 Dandridge
 H. D. SWINGLE, Associate Horticulturist
 HENRICK van de WERKEN, Assistant
 Horticulturist

INFORMATION

A. J. SIMS, Editor, Head of Department
 BETTY K. ADAMS, Agricultural Librarian
 FRED BERGGREN, Assistant Editor
 J. CORDELL HATCH, Assistant Editor

R. C. McDADE, Visual Aids Specialist
 FLETCHER SWEET, Associate Editor
 R. E. WRIGHT, Editorial Assistant

PHYSICS

K. L. HERTEL, Physicist
 C. J. CRAVEN, Associate Physicist
 P. R. EWALD, Associate Physicist¹

R. S. KROWICKI, Assistant in Physics
 C. B. LANDSTREET, Assistant Physicist¹
 REBA LAWSON, Assistant in Physics¹

PLANT PATHOLOGY

J. O. ANDES, Head of Department (on leave)
 H. E. REED, Associate Plant Pathologist,
 Acting Head
 A. Y. CHAMBERS, Assistant in Plant
 Pathology, Jackson
 BURTON Y. ENDO, Associate Plant
 Pathologist¹, Jackson
 JAMES M. EPPS, Associate Plant Pathologist,
 Jackson¹

E. L. FELIX, Associate Plant Pathologist
 LEANDER F. JOHNSON, Associate Plant
 Pathologist
 DENNIS H. LATHAM, Associate Plant
 Pathologist, Springfield
 H. A. SKOOG, Associate Plant Pathologist,
 Greeneville¹

POULTRY

O. E. GOFF, Head of Department
 J. K. BLETNER, Associate Poultry
 Husbandman
 J. H. KIDD, Assistant in Poultry Husbandry
 B. J. McSPADEN, Associate Poultry
 Husbandman
 R. P. MITCHELL, Assistant in Poultry

H. V. SHIRLEY, JR., Associate Poultry
 Husbandman
 D. B. SHOAF, Assistant in Poultry
 J. F. STEPHENS, Assistant in Poultry
 Husbandry
 R. L. TUGWELL, Associate Poultry
 Husbandman

MAIN STATION

J. N. ODOM, General Superintendent of
 Farms

SUBSTATIONS

BEN P. HAZLEWOOD, Superintendent, West
 Tennessee Experiment Station, Jackson
 E. J. CHAPMAN, Superintendent, Middle
 Tennessee Experiment Station, Spring
 Hill
 J. HUGH FELTS, Superintendent, Tobacco
 Experiment Station¹, Greeneville
 JOHN A. ODOM, Superintendent, Plateau
 Experiment Station, Crossville

E. L. BOHANAN, Assistant Superintendent,
 Plateau Experiment Station, Crossville
 LAWSON M. SAFLEY, Superintendent,
 Highland Rim Experiment Station,
 Springfield
 JOHN R. OWEN, Superintendent, Dairy
 Experiment Station, Lewisburg¹

UT-AEC AGRICULTURAL RESEARCH LABORATORY

NATHAN S. HALL, Laboratory Director
 J. MERRILL BIRD, Farm Superintendent
 EUGENE W. HUPP, Assistant Scientist
 LARRY P. JONES, Assistant Scientist
 U. S. GRANT KUHN, III, Lt. Col., U.S.
 Air Force (V.C.)²
 ROBERT H. MAYO, Assistant Scientist
 FRANK R. MRAZ, Research Scientist

ROBERT C. McILHENNY, Research Assistant
 HENRY B. PACE, Research Assistant
 NORMAN R. PARISH, Research Assistant
 DANIEL P. SASMORE, Lt. Col., U.S. Air
 Force (V.C.)²
 ROGER A. TEEKELL, Assistant Scientist
 RALPH E. THOMAS, Captain, U. S. Army,
 (V.C.)²

¹Cooperative with U. S. Department of Agriculture

²Cooperative with U. S. Army

³Cooperative with UT-AEC Agricultural Research Laboratory

Personnel Changes

APPOINTMENTS

- W. H. JONES, Accountant, January 15, 1958
 J. K. BLETNER, Associate Poultry Husbandman, July 1, 1958
 ROBERT L. WHITE, Assistant in Animal Husbandry, January 20, 1958
 CLARENCE D. GADY, Assistant in Animal Husbandry, March 17, 1958
 CLYDE E. SMITH, Associate Veterinarian, March 3, 1958
 CHARLES R. GASS, Assistant in Agronomy, April 1, 1958
 JERRY BARRON, Assistant in Animal Husbandry, July 1, 1958
 R. J. COOPER, Assistant Animal Husbandman, July 15, 1958
 H. D. BAXTER, Assistant Dairy Husbandman, April 15, 1958¹
 CAROLYN A. WERMAN, Assistant Textile Chemist, September 1, 1958
 DAVID B. SHOAF, Assistant in Poultry, July 1, 1958
 L. MILES CARPENTER, Assistant in Dairy, July 1, 1958
 R. P. MITCHELL, Assistant in Poultry, January 1, 1959
 ALICE WHEI-CHU HU, Assistant in Horticulture, September 1, 1958
 MARSHA JAN CRUZE, Assistant in Food Technology, July 1, 1958
 LEON E. ORME, Assistant Animal Husbandman, July 1, 1958
 H. B. SMITH, Assistant in Agronomy, September 1, 1958
 JOHN R. OWEN, Superintendent, Dairy Experiment Station, September 1, 1958¹
 J. C. WEBB, Assistant Agricultural Engineer, September 1, 1958¹
 LANTIS RATCLIFF, Assistant Dairy Husbandman, October 1, 1958¹
 VERNON E. ROSS, Assistant Agricultural Economist, October 1, 1958
 C. E. FULLER, Assistant Agricultural Economist, October 1, 1958
 HENRICK van de WERKEN, Assistant Horticulturist, October 1, 1958
 BURTON Y. ENDO, Associate Plant Pathologist, October 9, 1958¹
 D. F. BURCHFIELD, Assistant in Animal Husbandry, December 4, 1958

RESIGNATIONS

- CECIL S. McMINN, Assistant in Animal Husbandry, January 18, 1958
 WILLIS B. SMITH, Assistant in Animal Husbandry, March 17, 1958
 C. D. FISHER, Assistant in Agronomy, April 15, 1958
 GENEVA T. HAMILTON, Assistant Textile Chemist, September 31, 1958
 MARJORIE H. CHRISMAN, Assistant in Food Technology, July 30, 1958
 S. G. BREELAND, Assistant Entomologist, July 15, 1958
 IRA L. DYER, Assistant Animal Husbandman, July 30, 1958
 CHARLES W. LINGERFELT, Assistant in Agronomy, June 30, 1958
 WM. M. WHITAKER, Assistant Dairy Husbandman, July 31, 1958
 C. L. SCROGGS, Associate Agricultural Economist, September 15, 1958
 DAVID L. BROWN, Associate Agricultural Economist, September 20, 1958
 F. W. COOLER, Assistant Horticulturist, September 31, 1958
 WM. V. SIGLER, Assistant in Agronomy, November 30, 1958

RETIRED

- A. G. Van HORN, Superintendent, Dairy Experiment Station, June 30, 1958

DIED

- RICHARD J. HOLDER, Forestry Assistant, May 23, 1958
 H. A. ARNOLD, Associate Agricultural Engineer, October 5, 1958