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THE UNIVERSITY OF TENNESSEE AGRICULTURAL EXPERIMENT STATION

FORTY-SEVENTH ANNUAL REPORT

1934

KNOXVILLE, TENNESSEE

THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXPERIMENT STATION
Knoxville

JAMES D. HOSKINS, President

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E. K. WEATHERS, Asst. Biochemist

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SUBSTATIONS

BEN P. HAZLEWOOD, Supt., West Tennessee Experiment Station, Jackson
L. R. NEEL, Supt., Middle Tennessee Experiment Station, Columbia
F. S. CHANCE, Supt., Tobacco Experiment Station, Greeneville*
LESTER WEAKLEY, Asst., Mericourt Experiment Station, Clarksville

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* Cooperative with U. S. Dept. of Agr.

The Agricultural Building, containing the offices and laboratories of the Experiment Station, the College class rooms, and the headquarters of the Agricultural Extension Service, is located at the University Farm, on Kingston Pike, about one mile west of the main campus. Farmers are cordially invited to visit the building and the experimental grounds.

Bulletins of this Station will be mailed free to any farmer in the State. Write Agricultural Experiment Station, University of Tennessee, Knoxville, Tennessee.

LETTER OF TRANSMITTAL

Knoxville, Tennessee, January 1, 1935

To His Excellency, Hill McAllister, Governor of Tennessee.

Sir: I have the honor to transmit 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 1934. This report is submitted in accordance with the law requiring that the Board having direction of the Experiment Station shall annually submit to the Governor of the State a report of its operations and expenses.

Very respectfully,

JAMES D. HOSKINS, President.

THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXPERIMENT STATION

In account with

The United States Appropriations, 1933-1934

Receipts

	Hatch Fund	Adams Fund	Purnell Fund
U. S. Treasurer	$15,000.00	$15,000.00	$60,000.00

Disbursements

Personal services	12,025.63	11,252.02	47,224.06
Supplies and materials	448.56	633.23	2,563.85
Communication service	332.41	1.33	37.27
Travel expenses	75.23	94.10	528.62
Transportation of things	36.16	41.57	256.88
Publications	668.29	.....	962.54
Heat, light, water, and power	11.40	93.83	524.36
Contingent expenses	5.88	.....	144.33
Equipment	1,396.44	2,849.67	5,059.57
Buildings and land	.....	34.25	2,698.52
Total	$15,000.00	$15,000.00	$60,000.00
Balance	.....	.....	.....

FORTY-SEVENTH ANNUAL REPORT OF THE AGRICULTURAL EXPERIMENT STATION OF THE UNIVERSITY OF TENNESSEE, FOR 1934

INCREASED ACTIVITIES

The year 1934 was marked by greatly increased Station activities, due mainly to various cooperative undertakings with the Tennessee Valley Authority. In particular may be mentioned the cooperative experiments with farmers in the trial of new phosphates; also numerous fertilizer experiments conducted both in the field and in rims at the Knoxville Station. An increase of $1,000.00 per annum, or a total of $5,000.00, was allowed by the TVA for the fertilizer work.

CONTRIBUTIONS OF IMPORTANCE

Some of the more important recent contributions by the Station are as follows:

1. Cotton, corn, turnips, and cabbage were found to be mutually helpful when intercropped, because of the encouragement given to the natural parasitic and predatory insect enemies of plant lice. On the other hand, tobacco and other plants with sticky leaves were found to act as natural traps for these allies of the farmer and are therefore not suitable for strip cropping.

2. The green leaves of cabbage were found to contain 0.7 unit of vitamin G per gram, but the white leaves only 0.2 unit. The green cabbage is therefore three and one-half times as rich a source of vitamin G as the white cabbage.

3. Vegetative propagation was shown to be a practical means of continuing the qualities of superior pyrethrum selections.

4. It was revealed that a distinct repressive effect is exerted by limestone supplements upon the fluorine carried by barium fluosilicate, and this finding indicates that the fluorine content of phosphatic fertilizers will not be a problem when supplemental liming is practiced.

5. After many trials, a high-grade dicalcium phosphate, fluorine-free and well adapted to animal feeding, was obtained. The product can be very cheaply made and requires so little equipment that it can be produced on the farm or as a community undertaking.

6. The practical control of apple fire blight was found to depend on the timely spraying of the trees while in bloom, together with the continuous pruning of affected wood and the treatment of cankers.

PUBLICATIONS

The following publications came from the Station during the year:

BULLETINS

Bulletin No. 150—Control of Weevils in Stored Beans and Cowpeas, by S. Marcovitch. 8 pages. March, 1934. Simple, practical methods adapted to farm use are given for the control of bean weevil, cowpea weevil, and grain weevil.

Bulletin No. 151—The Woolly Aphid in Tennessee, by S. Marcovitch. 16 pages. March, 1934. Observations and experimental results over a number of years are given. The main source of infestation, the most promising insecticides, and a simple method to prevent root infestation are pointed out.

Bulletin No. 152—The Conservation of Burnt Lime, Limestone, and Calcium Silicate in Soil as Influenced by Methods of Incorporation, by W. H. MacIntire, W. B. Ellett, W. M. Shaw, and H. H. Hill. 52 pages. April, 1934. This is a technical bulletin, which gives the results of 8-year lysimeter studies conducted jointly by the Tennessee and Virginia Experiment Stations. Results of both scientific and practical interest were obtained.

Bulletin No. 153—Farm Price of Cotton in Relation to Quality, by C. E. Allred, G. H. Hatfield, and P. B. Boyer. 32 pages. August, 1934. This bulletin is a factual study, from which suggestions are made of improvements that would enable growers to get better returns for their crops.

CIRCULARS

Circular No. 46—Sweet Potato Sirup, by G. A. Shuey. This circular gives a simple method for making an excellent sirup at home.

Circular No. 47—Select Varieties of Cotton, by S. H. Essary. This circular gives the yields and other data obtained in a 5-year trial of a number of the more prominent varieties of cotton at each of three places—Knoxville, Murfreesboro, and Jackson.

Circular No. 48—Home Preparation of Strawberry Juice, by G. A. Shuey. This circular gives simple, practical methods for keeping strawberry juice and making strawberry sirup.

Circular No. 49—Korean Lespedeza, by C. A. Mooers. This circular treats chiefly of cultural practices.

Circular No. 50—Sour-Cherry Spraying, by J. O. Andes. Sour cherries frequently fail because of a leaf-spot disease which causes the leaves to fall off prematurely. This circular gives the results of spraying experiments for the control of the trouble.

Circular No. 51—The Japanese Persimmon in Tennessee, by Brooks D. Drain. This circular gives something of the history of cultivated persimmons in the State and discusses varieties, propagation, and outlook for this crop.

OTHER PUBLICATIONS

Department of Chemistry

MacIntire, W. H., Shaw, W. M., and Robinson, Brooks. The Distinction between Magnesium Absorbed and That Exchangeable, Four Years after Lysimeter Incorporations of Oxides and Carbonates. Soil Sci., Vol. XXXVII, No. 4, pp. 289-303, 1934.

MacIntire, W. H., and Shaw, W. M. The Transition of Citrate-Soluble Phosphate into the Citrate-Insoluble Form in Mixtures with Limestone and with Dolomite. Am. Soc. Agron., Vol. 26, No. 8, pp. 656-661., 1934.

Shuey, G. A. Report on Fluorine Compounds. Jour. A. O. A. C., pp. 149-156, 1934.

Department of Horticulture

Drain, Brooks D., and Shuey, G. A. The Isolation and Propagation of High Pyrethrin Strains of Pyrethrum. Proc. Am. Soc. Hort. Sci., Vol. 32, pp. 190, 191, 1934.

Henry, E. M. The Germination of Strawberry Seeds and the Technic of Handling the Seedlings. Proc. Am. Soc. Hort. Sci., Vol. 32, pp. 431-433, 1934.

CHANGES IN STAFF

NEW MEMBERS

Mr. E. K. Weathers began work as Assistant Biochemist July 1, 1934. Mr. Weathers received a B. S. degree from the University of Missouri in 1931 and did miscellaneous analytical work for the Tennessee Station in 1933 and 1934.

Mr. R. L. Long and Mr. E. L. Bohanan began work as assistants in agronomy February 1, 1934.

RESIGNATIONS

Mrs. Norabelle Weathers, Assistant Biochemist, resigned June 30, 1934.

Mr. Kay H. Beach, Assistant Horticulturist, resigned October 31, 1934.

REPORTS BY DEPARTMENTS

AGRONOMY

H. P. Ogden

WEATHER

The weather during 1934 was favorable for all field crops. Annual lespedezas were particularly good, due to abundant rainfall in August. Excellent stands and good early growth were secured from fall seedings as a result of the unusually favorable October rainfall.

SMALL GRAINS

Varietal trials with wheat, barley, rye, and oats were continued. Low temperatures of 6° F. in January and 9° F. in February brought out clearly the greater cold resistance of Balbo rye over Abruzzi. Yields of Balbo were almost 25 per cent above those of Abruzzi. In mild years the yields of the two varieties are more nearly the same.

WINTER PEA BREEDING

Further selection for disease resistance and winter hardiness was made among strains developed from crosses of Austrian winter peas and garden peas. The winter of 1933-34 was sufficiently cold to eliminate a large number of the less winter-hardy strains. Winter hardiness in peas is due to several factors. The two major factors affecting susceptibility to winter injury are (1) the direct effect of the cold on the plant tissues, and (2) the greater tendency to heave of diseased plants. In mild winters the disease factor is the more important, but in cold winters both factors operate.

Apparently, Austrian peas are genetically pure for both types of winter hardiness but have little or no resistance to Ascochyta blight (*Mycosphaerella pinodes*). The object of this project is to develop a field or garden pea that possesses the winter hardiness of the Austrian winter pea and is also more resistant to Ascochyta blight and similar diseases. While some selections from previous crosses appear decidedly superior to Austrian winter peas, none has been found entirely satisfactory.

SOYBEANS

Two hundred varieties and strains of soybeans were tested for yields of hay and seed and the ability to hold their seeds from shattering out of the pods.

LESPEDEZAS

Two new strains of Korean lespedeza, Nos. 19601 and 19604, were received from the Division of Forage Crops and Diseases, U. S. D. A. No. 19601 is appreciably later than the standard Korean, and in this preliminary test slightly outyielded it in both hay and seed. The leaves, however, were small and pale and the hay was stemmy and of rather poor quality. No. 19604 was much earlier than the standard Korean and the plants were much smaller. Apparently it will not be useful here.

Lespedeza cystoides is another new but unpromising perennial. It might be described as a dwarf spreading sericea, high in tannin.

Experiments to test the influence of time of cutting hay on yields of seed of annual lespedezas were continued.

Seeding and cultural experiments with sericea were also continued.

Hop clover (*Trifolium procumbens* and *T. dubium*) seeded in October on sericea stubble gave good stands even where there was a mat of leaves more than an inch thick on the ground.

No difficulty was experienced in turning sericea sod on sandy loam soil or in the cultivation of corn where the sod was turned. Results were about the same as with alfalfa sod. However, on heavy clay or gravelly soils sericea sod proved to be more difficult to plow than alfalfa.

TENNESSEE ANTHRACNOSE-RESISTANT RED CLOVER

For several years this Station has cooperated with the U. S. Division of Forage Crops and Diseases, the Oregon Experiment Sta-

tion, and the Idaho Experiment Station in testing the retention of anthracnose resistance in red clover when grown in western states. The seed used in these tests was originally Tennessee anthracnose-resistant (T. A. R.) red clover. After being grown in these western states for one, two, three, and four generations, it is brought back to this Station and seeded in comparison with Tennessee-grown T. A. R. clover.

This experiment has been conducted several years, and there is now some evidence that even when great care is practiced by western growers there may be loss of disease resistance after three or four generations. This may necessitate occasional replenishing with Tennessee-grown T. A. R. clover on the part of western growers. This would of course require the maintenance of pure stocks of T. A. R. clover either in Tennessee or under similar climatic conditions.

FERTILIZER EXPERIMENTS

Various phosphates were tested both alone and in combination with other fertilizing materials and supplements. These experiments were conducted on soils in East Tennessee low in phosphate. The more important crops of the region were used. These experiments were carried on in cooperation with the Tennessee Valley Authority and the experiment stations of the Tennessee Valley states.

Five phosphates were used in these tests—superphosphate, monocalcium phosphate, dicalcium phosphate, tricalcium phosphate, and monomagnesium phosphate. It is hoped that these experiments will be continued several years to get the residual as well as the immediate effects of these different materials.

Long-time fertility and rotation experiments were continued as in past years.

ROTATION EXPERIMENTS

Long-time fertilizer and liming experiments in each of two crop rotations were continued as for a number of years in the past. The results show not only the value of a legume in the rotation, but also the necessity of both manure and lime, if any high standard of soil productivity is to be maintained.

ANIMAL HUSBANDRY

M. Jacob

BEEF-CATTLE-FEEDING EXPERIMENTS

In November, 1933, a steer-feeding experiment was begun at the Knoxville Station to determine the influence on finishing 2-year-old steers when dicalcium phosphate ($CaHPO_4$) is added to a standard steer-feeding ration consisting of cottonseed meal, and corn-and-sorghum silage.

In this the first year of the experiment, 24 medium-grade 2-year-old steers were used. They were divided into 2 uniform lots of 12 steers each. Both lots received the following ration

throughout the entire experimental feeding period of 150 days: 3 pounds of cottonseed meal per steer per day during the first 30-day period, 4 pounds the second, 5 pounds the third, 6 pounds the fourth, and 7 pounds the fifth 30-day period. Corn-and-sorghum silage was fed *ad libitum*, and the cattle had free access to salt and water. Beginning with the second 30-day period and throughout the remainder of the time lot 2 also received 2 ounces of dicalcium phosphate ($CaHPO_4$) per steer per day. Feeding was done twice a day at regular intervals, and both lots were fed and kept in the barn throughout the entire feeding period. The results for this year were in favor of lot 2, in which the average gain per steer was 321.4 pounds, as against 303 pounds for lot 1—a difference of 18.4 pounds per steer in favor of lot 2. A study of the calcium and phosphorus content of the blood is also being made. This experiment will be continued until definite conclusions may be drawn.

The steer-feeding-and-grazing experiment begun at the Middle Tennessee Station, Columbia, in 1929 to determine the amount of grain necessary to feed 2-year-old steers being finished on grass in order to produce the most economical gains and at the same time have sufficient finish to meet market requirements, was repeated this year. The cattle, which were of medium grade, were again divided into 5 uniform lots of 5 steers each. All lots were on uniform pasture throughout the entire grazing and feeding period of 152 days, from April 7 to September 6, 1934. Lot 1 received no grain and no dry roughage; lot 2 received 5 pounds of crushed corn-and-cob meal per steer per day in addition to pasture; lot 3 received 5 pounds of crushed corn-and-cob meal per steer per day and all the hay the steers would consume; lot 4 received 4 pounds of crushed corn-and-cob meal and 1 pound of cottonseed meal per steer per day; lot 5 received 10 pounds of crushed corn-and-cob meal per steer per day. The average daily gain per steer per day during the 152-day feeding and grazing period was 1.37 pounds for lot 1; 1.44 for lot 2; 1.67 for lot 3; 1.59 for lot 4, and 1.71 for lot 5. The average selling price was $5.70 per cwt. for lot 1, $5.70 for lot 2, $6.00 for lot 3, $6.00 for lot 4, and $6.00 for lot 5. The average profit per steer was $6.61 for lot 1, $1.11 for lot 2, $4.17 for lot 3, $7.92 for lot 4, and $1.38 for lot 5. As during previous years under pasture conditions as they existed at the Middle Tennessee Station, heavy grain feeding was the least profitable; the results this year being in favor of light- and no-grain feeding in finishing 2-year-old medium-grade steers on pasture.

The beef-cattle-cost-of-production experiment at the Middle Tennessee Station is being continued. Up to the present time purebred Shorthorn bulls have been used exclusively as herd sires on the breeding females, consisting of grade Shorthorns. This year a purebred Hereford bull of the thick, smooth, lowset type is being used. It will give an opportunity to make some comparison, especially as to type, with the calves of previous years.

While various studies are being made on cost of production of beef cattle, a feeding trial was undertaken during this year with baby beeves, comparing 2 lots. Lot 1 was fed a ration of silage and legume hay with ground shelled corn and cottonseed meal as the concentrate. Lot 2 was fed silage and legume hay with cottonseed meal alone as the concentrate. There were 8 uniform Station-raised grade Shorthorn calves in each lot. They were on feed from November 1, 1933, to May 21, 1934. Some details of the trial are given in the following table:

Data on baby-beef experiment

	Lot 1 Corn and cottonseed meal	Lot 2 Cottonseed meal
Number of calves	8	8
Number of days on feed	201	201
Average initial weight (lbs.)	395.9	402.1
Average final weight (lbs.)	692.5	672.5
Average gain per calf (lbs.)	296.6	270.4
Average daily gain per calf (lbs.)	1.47	1.35
Cost per cwt. gain	$ 5.12	$ 6.44
Average selling price per cwt.	5.91	5.74
Net profit per calf	3.10	1.86

The results are in favor of lot 1. The calves in this lot carried better finish and dressed 2 per cent higher than those in lot 2. It should also be noted that, as during previous years, it was profitable to feed and finish calves as baby beeves by the time they were from 12 to 16 months old.

It is intended next year to submit additional data on this experiment covering the entire period since it was started in 1925.

A baby-beef-feeding-and-grazing experiment was begun at the West Tennessee Station, located at Jackson. The object was to determine the amount of grain necessary for most economical finishing of baby beeves, with free access to winter, spring, and summer pasture. Twenty-four good grade beef calves of weaning age were selected, and divided into 3 uniform lots of 8 calves each. All lots were grazed on the same pasture, consisting of both crimson clover and barley during winter and early spring, permanent pasture during spring and summer, and also sudan grass during part of the summer period. Lot 1, in addition to pasture, was fed alfalfa hay *ad libitum* while in the barn. Lot 2 was fed and grazed the same as lot 1, but in addition was fed a grain mixture of 2 parts, by weight, of crushed corn-and-cob meal and 1 part of cottonseed meal, at the rate of 4 pounds per head per day. Grain feeding to this lot was discontinued in the spring when the cattle were turned on permanent pasture. Lot 3 was fed and grazed the same as lot 2 during the winter period, but when turned on permanent pasture the grain ration was increased to 6 pounds per head per day. At the end of the winter feeding and grazing period there was considerable difference in the condition of the 3 lots; lot 3 being first, lot 2 second, and lot 1 third. At the end of the summer grazing period, lot 3 was first, lot 1 second, and

lot 2 third. Lots 2 and 3 both made better gains than lot 1. However, at the end of the summer period the market was greatly depressed, and as none of the lots carried the most desirable finish for baby beeves, especially lots 1 and 2, they were stall-fed for future marketing. This experiment will be continued in order that additional information may be obtained.

LAMB STUDIES

This was the third and final year on the experiment devoted to the study of the value of supplemental feeds for early spring lambs finished on pasture. As previously reported, this work is in cooperation with the U. S. Bureau of Animal Industry. The results in 1934 were almost identical with those obtained during the previous two years, as is shown in the tables:

Weights and gains of spring lambs, 1934

	Lot 1 Grain	Lot 2 No grain
Number of lambs	31	33
Days of experiment	108	108
Average birth weight (lbs.)	8.2	8.1
Average weight at beginning of test (lbs.)	25.6	24.6
Average weight at end of test (lbs.)	88	88
Average gain in 108 days (lbs.)	62.3	63.3
Grain consumption per lamb for 108 days (lbs.)	40.9	

Slaughter and carcass grades of spring lambs, 1934

	Choice	Good	Medium	Common	Cull	Average
Slaughter grade						
Lot 1, grain	3	16	12			Good
Lot 2, no grain	1	22	10			Good
Carcass grade						
Lot 1, grain	3	20	8			Good
Lot 2, no grain	3	22	8			Good

During the three years of this experiment, 216 lambs were used, of which 107 were in the grain lots and 109 in the no-grain lots. Since the results each year showed an average grade of good, on foot and in the carcass, for both lots of lambs, it is justifiable to conclude that feeding grain is not essential for the production of top early spring lambs under pasture conditions as they exist at the Middle Tennessee Station.

The study of breeds of sheep most suitable for Tennessee is still under way. Originally, it included a comparison between the Hampshire, Southdown, Shropshire, Dorset, and Rambouillet breeds. Up to this time we have been justified in eliminating the Rambouillet, and this year the use of Shropshire rams has also been discontinued, leaving only Hampshire, Southdowns, and Dorsets. Further comparisons will be made to determine which of these breeds, if any, should be dropped.

A study of sheep performance in spring-lamb production has been undertaken, in cooperation with the Bureau of Animal Industry, U. S. Department of Agriculture. The object is to determine and improve the inherent capacity of sheep for spring-lamb production, including profitable production of lamb meat and

wool. As a beginning, carefully selected Hampshire rams are being used in this work in the flocks at the Knoxville and Middle Tennessee Stations. Rams of other breeds will also be used later.

PIG-FEEDING-AND-GRAZING EXPERIMENT

The pig-feeding-and-grazing experiment is being continued at the Middle Tennessee Station. This study is for the purpose of determining the comparative values of alfalfa, bluegrass, sweet clover, lespedeza, and other grazing crops for fattening pigs when grazed with the standard ration of corn and high-grade (60 per cent) tankage. The interesting thing so far is the very little difference which exists in cost per hundredweight gain between alfalfa and bluegrass. While somewhat more economical gains have been obtained when the pigs were grazed on alfalfa, there are certain advantages to bluegrass which may place it very close or even equal to alfalfa as a grazing crop for growing and fattening pigs.

DAIRY-CATTLE-FEEDING-AND-GRAZING EXPERIMENT

The experiment begun at the West Tennessee Station in 1932 to determine the amount of grain necessary for most economical milk production is well under way. As the outline of the experiment provides that each cow is to be kept in the respective lot (either grain or no-grain) during two complete lactation periods and then placed with the other lot for a similar period, it will by the end of this year be possible to begin the transfer of some of the cows. This experiment, although far from complete, is creating a great deal of interest, and gives promise of yielding valuable information of interest to dairymen in Tennessee.

The dairy-cattle-feeding-and-grazing experiment being conducted at the Middle Tennessee Station, and differing from the experiment at the West Tennessee Station in that one lot of cows receives a half-grain ration instead of no-grain, in comparison with a lot receiving a full-grain ration, has been under way only during the past year. Hence, there is nothing conclusive to report at the present time. This experiment also is creating much interest; and the combined results of the work at the two stations, after a sufficient period of time, and with the number of animals involved, should justify definite conclusions.

BANG'S-DISEASE CONTROL

The work on the control of Bang's disease in the breeding herds at both the Middle and West Tennessee Stations is still under way. All the breeding cattle in both herds are now being subjected to the agglutination test for infection of this disease every 90 days. Up to and including this year, there have been no reactors and no abortions in the West Tennessee Station herd since the work was started, 9 years ago. The herd at the Middle Tennessee Station, consisting at all times of from 90 to 100 head of breeding cattle, has again responded satisfactorily to the well-established plan of control. Only one animal had to be eliminated this year

on account of being definitely positive to the test. The present plan of control, which embodies blood testing at regular short intervals, isolation when necessary, sanitation, and proper herd management, will be continued.

The help and cooperation of Mr. L. R. Neel, Superintendent of the Middle Tennessee Station, Mr. Ben P. Hazlewood, Superintendent of the West Tennessee Station, and Professor H. R. Duncan, of Knoxville, has made it possible to carry out successfully our rather large program of livestock experimental work.

BOTANY

S. H. Essary

COTTON

The varietal trials of cotton were continued in 1934 along the lines described in previous reports. Circular of Information No. 26 gives the results of the 1933 and 1934 tests. Thus far, in production and other characters, the varieties rank much the same at Knoxville and Jackson. Stoneville 2, the D. P. L. strains 4-8, 10 and 11, and Delfos 719 are consistent leaders at both stations, and it appears that they have a wide range of adaptation.

A regional varietal test in cooperation with the U. S. Bureau of Plant Industry, Division of Cotton and Other Fiber Crops and Diseases, was added at the Jackson Station. The first year's results were satisfactory, and it is expected that in the course of time this test will give additional information of value upon varietal adaptation.

Selections of the cross Stoneville 2 x California Acala were very promising in their first trials with the parents in 1934. These selections are of the fourth generation. The object is to combine the quality of lint in California Acala with the earliness and productiveness of Stoneville 2. Inbred selections of Stoneville 2, California Acala, and Acala 44-5 were continued. These selfed lines are now in the fourth generation. Straight line selections of Acala 44-5 and Acala 5 were continued. One of these selections (2118) was very promising and will be placed in the 1935 varietal trials.

Selfed lines of cluster- and spreading-type strains were continued. These strains also possess other variable boll, lint, and seed characters. The object is to find whether or not there is any linkage between these lint and seed characters and vegetative type growths.

In cooperation with G. A. Shuey, of the Chemistry Department, studies were made on the artificial germination of cotton pollen. It was found that cotton pollen germinated under a fairly wide range of hydrogen-ion concentrations. Apparently, the optimum condition lies between pH 9 and pH 10. Further studies on this subject are planned.

Twenty-three hundred individual seed samples, representing 3 varieties, were run upon the cotton fibrograph, developed recently

by K. L. Hertel, of the Physics Department. This large number of samples offers valuable information on length of lint distributions around the seed.

TOMATOES

Equal areas of old land, contaminated with the wilt organism, and new land were set in the tomato varieties and selections. Because of the wilt on the old land, none of the varieties lived long enough to show any resistance to leaf spot. On the new land, leaf spot showed in practically all selections and varieties, but worse in some than others. Thus far the results of selection for resistance to leaf spot have not been encouraging, but selection of the most resistant strains is being continued.

The selections of the cross between the Marglobe strains and the prolific small-fruited Australian variety, Bendigo Red, have shown some promise. Bendigo Red has shown some resistance to leaf spot all along, and is said to be somewhat adapted to low temperatures. By use of the greenhouse, third-generation segregates will be ready for the 1935 field plantings. Selections of the cross between a multi-fruited unknown variety and Marglobe have also shown some promise in their resistance to leaf spot. A small number of fourth-generation selections will be planted for field comparisons in 1935.

RED CLOVER

Plants of the more desirable progeny rows of red clover were grown in the greenhouse, and hand-pollination was resorted to. Selfing the plants by this method was not very successful. Other methods will be tried in 1935. Progeny row 22, of the 1932 seeding, appears to be very promising. This selection is now in its third year, whereas all other selections of this seeding have died out.

Selections resistant to mildew are still being made, although it is very difficult to find whether the plant actually possesses some resistance or whether the apparent resistance is due to the stage of growth at the time observation was made.

Selecting resistant strains with a typical seed color was continued. Some of the plant selections gave seed true to the violet and yellow colors, but it will be a complicated matter to continue them until better methods of selfing are obtained.

OATS

Twenty-five hundred head selections of oats were planted in 1930 and the same number in 1931, with a view to obtaining a winter-hardy oat variety for Tennessee. A large number of these selections came from over the State, but those from Fulghum 699-2011 appeared to be the most promising. Tennessee selection 090 proved to be very winter-hardy. In the U. S. Bureau of Plant Industry, Division of Cereal Crops and Diseases, cold-chamber tests at Ames, Iowa, Tennessee 090 stood first during the season of 1933-34. Other selections that ranked high in this test were 1945, 11053, 1962, and 1884. It is planned to continue these selections in

further cooperative tests with the U. S. Bureau of Plant Industry. Also further field trials will need to be conducted before these selections can be designated as of economic value to the State.

BARLEY

In 1929, reciprocal crosses were made between Tennessee No. 52 (a gray bearded barley) and Lions (a Russian black smooth-awn barley). No. 52 is very productive and has a decidedly winter habit of plant growth; whereas Lions has a spring habit. The cross was made with a view to obtaining a barley with a smooth awn and retaining the productiveness and winter habit of No. 52. This year some promising selections were obtained, which appear to be breeding true, or homozygous. These selections will be tested against No. 52 to determine whether or not they are of economic value.

CHEMISTRY

SOILS

W. H. MacIntire

During the past year considerable time has been devoted to the study of methods of analyses for absorbed calcium and magnesium in soils in the presence of carbonates of lime, there being no published method suitable for this purpose. A simple, rapid, and accurate procedure for the determination of absorbed calcium and magnesium in soils was evolved. This procedure and its several applications to soil analyses have been described in a paper accepted for publication by *Soil Science.*

A laboratory study of the relation of absorbed lime derived from field liming of soils with limestone and caustic forms of lime has been completed. In this study, use was made of Tennessee soils and soils from the oldest liming experiments of other states. It was found that, of the extensive absorption of calcium resultant from continued field applications of limestone, only a fraction of the absorbed calcium is in forms exchangeable with NH_4 when the soils are digested and leached with cold solutions of ammonium chloride or ammonium acetate. Different procedures for the determination of the absorbed calcium have been used in this study, and it is found that none of the recorded procedures gave a complete recovery of the absorbed calcium, whereas complete recovery was registered by the ammonium chloride distillation procedure that has been developed.

In the calcium and magnesium silication project, which deals with absorption of calcium and magnesium by soils, as influenced by rate of treatment and kind of material, the outgo of bases was somewhat less than in the preceding year, but the previous relationships between treatment and loss of calcium and magnesium continue. The marked retentive capacity of the subsoil for these bases is still in evidence. The nitrate nitrogen outgo of approximately 20 pounds per acre shows some fluctuations, but no marked

effect was in evidence for either treatment or subsoil. The sulfate outgo of about 80 pounds of SO_3 per acre from the untreated soil continues to be stopped by the subsoil, whereas the subsoils of the lime-treated soils do not register this effect. July, 1934, represents the twentieth birthday of this project, and at that period the surface soils were taken up, thoroughly mixed, and returned to their original containers.

The study of the direct solubility of calcic and magnesic materials in rainwater was continued. The average outgo of $CaCO_3$ from two 53-ton additions of limestone and of dolomite were 233 pounds and 348 pounds, whereas the rainwater alone leaching through the sand control carried a 165-pound equivalence of $CaCO_3$. The magnesium outgo from the magnesium oxide and magnesium carbonate treatments showed 3500 and 3800 pounds $CaCO_3$-equivalence for the light oxide and light carbonate, respectively, and 2500 and 2800 pounds for the parallel heavy materials.

Samples taken from this experiment after a year's exposure in lysimeters were analyzed during the past year for the purpose of establishing the MgO, CO_2, and H_2O relationship in the magnesic materials at that stage. The analyses showed that 17.6 per cent of the light MgO addition had become carbonated, as against only 9.1 per cent for the heavy MgO. Both the light and heavy forms of MgO had become completely hydrated. The light and heavy carbonates of magnesia showed a slightly higher ratio of carbonate to MgO than is called for by the formula $3MgCO_3.Mg(OH)_2$. The crystalline magnesium carbonate showed a ratio of CO_2 to MgO corresponding to the formula $3MgCO_3.^{60}Mg(OH)_2$. From this ratio it may be seen that the hydrolysis of the normal carbonate progressed two-thirds of the way toward the hydroxy carbonate of the formula $3MgCO_3.Mg(OH)_2$.

The lime-potash absorption studies were continued, with another addition of 200 pounds K_2O in the forms of nitrate, chloride, and sulfate of potash to 3 different soils. During the past year the Jackson silt loam yielded about half of the last annual application. Neither limestone nor dolomite additions caused a potash fixation in this slightly alkaline soil. The unlimed Crossville soil retained one-half of the annual addition, whereas the limed units fixed three-fourths of the added potash, and the unlimed Cumberland loam behaved in a similar manner to the Crossville soil. In general, the absorption of potash in all experiments was greater during the past year than in the year preceding. In most instances absorption of potassium caused a corresponding release of calcium, whereas the magnesium outgo was only very slightly affected.

The related potash absorption on previously limed soils was continued. The effect of lime residue is still evident after 18 years. The sulfur-treated Cherokee clay loam acid soils retained about 38 per cent of the last annual addition of 200 pounds K_2O, whereas the limed units fixed about 60 per cent of the same addition. The

32-ton MgO treatment on the same soils continues to show an effect the reverse of that shown by all other MgO and CaO treatments, from 75 to 85 per cent of the annual potash additions being recovered in the leaching waters.

Diversity of opinion still exists relative to the effect of caustic lime on the availability of absorbed potash in the soil. To study this effect, 5 soils of variant chemical and physical composition and also one clay subsoil were selected. Before duplicate placement in lysimeters, all units were treated with posassium sulfate at the rate of 800 pounds K_2O per acre with intent to build up a reserve of exchangeable potash. The leachings obtained thus far indicate a distinct range in the absorptive capacities of these soils for potash. After the preliminary period of quantitative potassium build-up, it is planned to incorporate a heavy treatment of calcium oxide to one unit of each of the potash-treated soils. The potassium outgo from the limed units will then be compared with the potash losses from the unlimed units.

The study on the conservation of various liming materials, as influenced by rates and mode and frequency of additions, is being continued. The results of the first 8 years of this experiment have been published as Tennessee Station Bulletin No. 152. This bulletin also embodies the results of a parallel experiment carried out on a sandy soil by the Virginia Experiment Station in cooperation with this Station.

In the lime-phosphate experiment, in which the influence of limestone and dolomite upon the fate of superphosphate and reverted phosphate is being studied, the outgo of phosphate continues to be meager. Apparently the iron and aluminum content of the soil has served to minimize migration of P_2O_5, especially the calcium combinations.

The lysimeter study on the sulfate conservation from added sulfates of Ca, Mg, and K, with and without limestone or dolomite, was continued. The sulfate recoveries of the annual additions of the several sulfates were practically complete in the case of the limed soils, as against recoveries of 80-85 per cent for the unlimed soils.

A 4-year study on the effect of barium fluosilicate additions on the outgo of sulfates and other soil components was completed. The results, prepared for presentation in bulletin form, show a full fixation of barium without interchange for either Ca, Mg, or K. Definite decreases in sulfate supplies, increase in nitrification, and conversion of the added fluorine compound into calcium fluoride were recorded. The divergent effects of dolomite and limestone upon fluorine outgo were noted and the results given practical application.

A 4-year study of the effect of previous cropping and culture upon the subsequent outgo of bases and biological end-products was completed, and analyses of the residual soils will be carried out.

The chemistry-agronomy experiment on the utilization of various nitrogenous materials was continued, the fertilizer additions being made in January, however, instead of June. The rainwater leachings during February and part of January washed away all of the $NaNO_3$ treatments in the Cumberland clay loam. The other salts and also organics showed enhancement in outgo of only 2-3 pounds of nitrogen over the control from 33-pound additions. The first collections of leaching from the Jackson soil after treatment were made the latter part of March, and showed a greater nitrogen outgo from the various treatments, about 8 pounds over the control. The leachings were analyzed for NH_4 and NO_2, as well as NO_3, but the nitrate nitrogen accounts for the bulk of nitrogen in the leachings. The June collection, which comprised the spring leachings, yielded about 50 per cent of the nitrogen from the ammonium sulfate, "ammophos" and urea, but gave a low nitrogen recovery from the cottonseed meal and the cyanamid.

The adjunct experiment on the availability of various ammoniacal nitrogen carriers in 3 different Tennessee soils was continued. The several ammoniates were applied in January. The first 2 collections, covering leachings through February, March, April, and May, showed very little of nitrogen from any treatment except ammonium nitrate. The ammoniacal nitrogen outgo was insignificant, and nitrate nitrogen varied from 0 to 2.9 pounds nitrogen per acre. The average nitrogen outgo from the Jackson soil for the period January, 1933, to January, 1934, was about 25 pounds in excess of the control. The first leaching from this soil in January carried, as NH_3, from one-third to one-half of the added nitrogen, whereas the recoveries from the ammonium phosphates were practically nil for the Cumberland and Crossville soils, in contrast to practically complete recovery from the ammonium nitrate. The ammonium sulfate and ammonium chloride additions yielded about two-thirds recovery from the Cumberland soil and only about one-third from the Crossville soil.

A large number of experimental phosphatic mixtures were made in an attempt to develop a process for the making of suitable fertilizer products, particularly a dicalcium phosphate. Such a product was perfected as being made from limestone and concentrated phosphoric acid. This material is produced in a granular condition, which obviates the necessity for grinding. Upon curing at room temperatures, the material reaches an available P_2O_5 content of 46-48 per cent and is substantially a mixture of anhydrous and di-hydrate $CaHPO_4$. It is free of fluorine and its superiority over fluorine-carrying commercial dicalcium phosphates was demonstrated in rat-feeding experiments conducted by Dr. Florence L. MacLeod.

The Chemist and Associate Soil Chemist have served the A. O. A. C. as General Referee for Soils and Liming Materials, and Associate Referee for Liming Materials, respectively. The Associate

Chemist has served as Associate Referee for Fluorine. The Chemist also served as a Member of the Board of Governors of the Crop Protection Institute, as the designate from the A. O. A. C.

GENERAL

G. A. Shuey

In cooperation with the Department of Horticulture, chemical service has been rendered in the isolation and propagation of strains of pyrethrum of high pyrethrin content. During the year, 52 samples of flowers were analyzed for the content of active principles (pyrethrins I and II). Four samples of flowers from asexually propagated plants contained 1.5 to 2.0 per cent of the active principle; 13 analyses showed a content of from 1.0 to 1.5 per cent; and 35 between 0.5 and 1.0 per cent; the lowest being 0.52 per cent.

Further attention has been given to the study and perfection of methods for the analysis of fluorine compounds. The Willard and Winter method, referred to in the 1933 report, was further studied, with the result that several modifications have been introduced. The method as modified will be included in the Book of Methods now undergoing revision by the A. O. A. C.

The use of certain fluorine compounds, such as cryolite and barium fluosilicate, for insect control is becoming an orchard and vegetable garden practice. The problem of fluorine residues on fruits and vegetables at the time of harvest is being investigated. This problem is brought to the attention of both producers and consumers because of the fact that fruits and vegetables offered for sale are subject to a tolerance regulation, which is now set at 0.01 grain of fluorine per pound of fruit or vegetable.

Fluorine contents of spray residues on apples

Spray schedule	Fluorine content per pound of fruit		
	Total in peel and spray residue	In peel Average	In spray residue
	Grains	Grains	Grains
1. Lead arsenate and oil. Fruit washed	.0024	.0024	None
2. Cryolite Fruit not washed	.0616	.0024	.0592
3. Zinc arsenate Fruit not washed	.0045	.0024	.0021
4. Lead arsenate, oil, and Black Leaf 40 Fruit wiped mechanically	.0022	.0024	None
5. Lead arsenate, oil, and cryolite. Fruit washed and rewashed	.0102	.0024	.0078
6. Lead arsenate and cryolite. Fruit not washed	.0853	.0024	.0829
7. Lead arsenate and cryolite. Fruit not washed	.1612	.0024	.1588
8. No fluorine spray	.0026	.0024	.0002
9. No fluorine spray	.0026	.0024	.0002
10. Lime-sulfur, Black Leaf 40, arsenate of lead, oil, and cryolite. Fruit not washed	.0589	.00246	.0565
11. Same as 10 Fruit washed	.0135	.0024	.0111

During the year, numerous samples of apples and various other food materials have been analyzed for the fluorine content of spray residues, and also the natural fluorine content. As a matter of general interest and record, some of the results are included in this report.

It will be observed that when fluorine-sprayed fruit is properly washed, the residual fluorine is approximately that of the tolerance figure.

The fluorine contents of apple flesh and other food materials were also determined. Although the following results are not conclusive, they give some idea of the normal content of fluorine in the several materials analyzed.

Fluorine contents of various food materials

Material	Fluorine content per pound
	Grains
Apple, flesh only	.0054
Apple, flesh only	.0061
Apple, flesh only	.0058
Apple, peel only	.0024
Apple, flesh and peel	.0057
Cabbage, raw	.0036
Spinach, green	.0069
Corn meal	.0147
Rye bread	.0367
Whole-wheat flour	.0093
Whole-wheat grain	.0736
Wheat bran	.0855

Experimental work on the utilization of strawberries in the making of juice and semi-sirup was continued. It has been demonstrated that a sweetened juice of excellent flavor and good keeping qualities can be prepared. The best juices have resulted from moderate heating of the berries to 190° F., and holding at about this temperature for approximately 15 minutes, after which the juice is squeezed or pressed through muslin cloth. The juice is then sweetened by adding sugar at the rate of 2 pounds to one quart of juice and warming until dissolved. The warm semi-sirup is then poured into sterile bottles, capped, and submerged in water heated to 175° F., and held at this temperature for 30 minutes. Semi-sirup prepared in this way may be used on ice cream, for blending in fruit punches, and other flavoring purposes.

The investigations relative to the usefulness of the sweet potato resulted in the development of a process for making a dehydrated product. This study is being continued in cooperation with the Tennessee Valley Authority.

Further refinement of home methods for the making of jellies, vinegar, and sirup from sweet potatoes has also received attention.

Considerable analytical work, such as complete analyses of feeds, foods, fertilizers, and insecticides, has been done for the several departments of the Station. The calcium and phosphorus contents of blood taken from 24 beef animals have been determined

periodically during the year. Some cooperative chemical service has been given the department of Plant Pathology in attempts to develop new types of sprays.

In studies on the preparation of media for germinating cotton pollen, it was found that media prepared by incorporating certain salts, and carefully adjusted to a pH value of 10, gave results far superior to those formerly obtained. This work is to be continued.

Active cooperation has been given the TVA during the year in a study of clarification and evaporation of sorghum juice. This will be continued.

BIOCHEMISTRY

E. K. Weathers

Approximate analyses have been completed on 112 samples of the leaves, stems, and whole plant of a number of crops that were harvested at various stages of growth in 1932 and 1933. The determinations included moisture, ash, nitrogen, crude fiber, fat, and nitrogen-free extract. The following crops were included:

1. Annual lespedezas: Korean, Kobe, No. 76, and common.
2. Perennial lespedeza: Sericea.
3. Miscellaneous: Alfalfa, hop clover, bluegrass, Tokio soybeans, sudan grass, and silage.

These crops, with the exception of the soybean, sudan grass, and silage, were analyzed also for silica, calcium, magnesium, potassium, iron, manganese, and phosphorus. This group comprised a total of 74 samples of leaves and stems.

Tannin determinations were made on 93 samples of the 3 legumes—annual and perennial lespedezas, and alfalfa.

In 1934, 60 samples of annual lespedezas, 8 samples of sericea, 2 samples of alfalfa, and 48 samples of oats were cut and cured at the Knoxville Station. The leaves and stems of these samples were not separated, differing in this respect from the samples cut in 1932 and 1933. All of the samples for the 1934 crop have been prepared for analysis.

ECONOMICS AND SOCIOLOGY

C. E. Allred

FARM TAXATION AND COUNTY GOVERNMENT

In the last report, mention was made of a state-wide study of tax delinquency and related problems, which was just getting under way at the close of the year. This project was successfully carried out as planned, and has provided a mine of useful information on various aspects of farm taxation.

The CWA funds were used until April 12, at which time the project was terminated in all states. By that date we had made all tabulations required by the Washington Office. Since then other information of special interest and value within the State has been worked out. Maps have been made showing tax delinquency, not only by counties but by civil districts. A preliminary report is now

in preparation, entitled "Tax Delinquency on Rural and Other Property in Tennessee." It will be ready for publication early in 1935.

A question often asked is as to the ratio of assessment to true value in the various counties. This is important, as the tax rate does not correctly indicate the tax burden unless it is correlated with the basis of assessment. Heretofore no dependable information has been available for all the counties. This study, however, provides the opportunity to compare the assessment with the actual sale price on a large number of identical properties in each county.

SOUTHERN APPALACHIAN STUDY

The project relating to the Southern Appalachians is in the nature of a reconnaissance survey of this entire area, and has been carried out jointly by the experiment stations represented in the area and several national agencies. A manuscript has been prepared, entitled "Economic and Social Problems and Conditions of the Southern Appalachians." Consisting largely of maps and charts, it will make a printed report of about 200 large pages, and will be published by the U. S. Department of Agriculture. This report is one of the most valuable of its kind on any section of the country.

As the area studied included only the 44 eastern counties of Tennessee, no data were made available, for comparison, on the other 51 counties. To meet this need, a number of the more important series were extended to include all counties in the State.

EFFECT OF INDUSTRIAL DEVELOPMENT

Previous to this calendar year, field work on the Industrial Development project had been done on areas in 4 counties, and the data on each area have been tabulated separately. During the year, considerable work has been done toward combining the data for all areas and writing an analysis of them.

The areas studied have varied from strictly rural to suburban. It appears that both extremes have disadvantages in comparison with the better-balanced regions.

COTTON MARKETING

The study of cotton marketing was continued, in cooperation with the Federal Bureau of Agricultural Economics. During the year, a bulletin was published on the farm price of cotton in relation to quality.

One phase of the study which has been emphasized during the past year is the relation of the quality of cotton being grown in different sections of the State to the mill demand in the respective areas. Apparently the growers have given but little attention to this matter, in many instances.

Another aspect which has received special attention is that of cotton varieties. This study has made available for the first time a complete inventory of the varieties being grown, the relative prevalence of each in the respective communities, and the trend over a period of years.

In cooperation with several teachers of agriculture in the cotton-growing area, a study was made of farm practices affecting the quality of the cotton, and the methods of handling the fiber from farm to market.

COOPERATIVE ORGANIZATIONS

Pressure of work on other projects has required the time of the personnel available, and it has not been possible to advance the work on cooperative organizations very much during the past year.

TYPES OF FARMING

The study of types of farming is a new project, organized in cooperation with the Bureau of Agricultural Economics. It was not started until almost the end of the year. The first few weeks were spent in preparing preliminary plans, making a bibliography, becoming familiar with the literature, and gathering a few field data.

OTHER RESEARCH

A cooperative plan of research was arranged during the year with the Federal Emergency Relief Administration whereby a member of the Station staff has general supervision of the rural relief studies being made, or to be made, in the State. The FERA furnishes a full-time assistant supervisor, an editor, and clerical assistants, and pays traveling expenses. To date sample surveys have been started in Cocke, White, Overton, Grundy, Wayne, Houston, Williamson, and Henderson Counties.

Cooperation has been continued with the TVA, and a rather thorough analysis made of all existing data having a bearing on the marketing of Tennessee apples, cabbage, and irish potatoes.

During the year, cooperative arrangements were made with the AAA and the National Resources Board for work on land use classification in the State. The Station furnishes technical information and office space, while these organizations furnish a land planning consultant, traveling expenses, and clerical help. This project is of immediate importance, as it furnishes the basis for the selection of purchase areas, by the Government, for various purposes.

MISCELLANEOUS

The Agricultural Economist delivered an address at the annual meeting of rural sociologists in Chicago; one at the meeting of Southern economists in Chattanooga; and one before the Association of Southern Agricultural Workers in Memphis. He continued to serve as state representative of the American Farm Economic Association. A very large number of requests for information, from other departments and from citizens of the State, have been received and answered.

ENTOMOLOGY

S. Marcovitch

MELON APHIS

The melon aphis becomes, at times, one of the most injurious pests of cantaloupes, cucumbers, and watermelons. Because the lice

are found on the underside of the leaves, they are difficult to reach with a contact insecticide. Biological control for plant lice is by far the simplest and most economical. Where plant-louse damage occurs there is a scarcity of natural enemies at the beginning of the infestation. It is of the utmost importance to have the lady-bird beetles and other enemies present in the field before the lice get the upper hand.

The problem, therefore, is that of devising agricultural practices that will increase the effectiveness of the natural enemies already present, and of maintaining a relatively high level of parasites and predators through the judicial management of the environmental factors. One of the most important of these factors is the plant itself on which the insect feeds. The average trucker will plant his melons at one end of his farm and his cabbage at the other end. In many cases it would be just as easy to plant his melons and cabbage or turnips in strips of about 12 rows each in the same patch. Strip farming on the Station farm saved the melon crop from the attacks of plant lice. Solid plots of melons planted at the same time, only 120 yards away, were destroyed by the insects.

Cotton, corn, turnips, cabbage, and melons are thus mutually helpful when intercropped. The efficacy of the alternate planting is due to the shelter and encouragement the strips of other crops give to the natural parasitic and predatory insect enemies of plant lice. For this reason tobacco and other plants with sticky leaves that act as natural traps for these allies of the farmer are not to be favored as alternate strips. Melons interplanted with tobacco were destroyed by the aphids.

CUTWORMS

During the season of 1934 two light traps were operated in two different places for the study of moth population. One was placed on top of the Agricultural Building, five stories high, at the University farm, and the other was placed on top of a hotel which is 18 stories high. The traps were identical in construction and each used a 75-watt lamp. They were operated from June 29 to October 25, 1934. Catches were made on 53 nights at each location.

On the Agricultural Building, 122 species of moths were caught, and on the hotel, 100 species. On the Agricultural Building, 27 species were caught that were not caught on the hotel, but only 5 species were caught on the hotel that were not caught on the Agricultural Building.

A list was made of 25 of the most important species, and a comparison of the catches from the two traps showed that more moths of 5 species were caught on the hotel. These were *Autographa brassicae, Cirphis unipuncta, C. pseudargyria, Lycophotia margaritosa,* and *Prodenia ornithogalli.*

On the Agricultural Building, the catch of moths per night averaged 27.1 species and 110.3 specimens; on the hotel, 16.2 species and 58.7 specimens.

THE BEAN WEEVIL AND COWPEA WEEVIL

The general recommendations for the control of the bean weevil, *Mylabris obtectus*, are the same as for the cowpea weevil, *M. quadrimaculatus*. The work of the past year has shown that the latter is much more resistant to control by dusts. Two parts of peas mixed with one part of hydrated lime gave protection. For the bean weevil, 2 per cent hydrated lime when thoroughly mixed with the beans was sufficient to prevent injury.

With sodium fluosilicate, one part to 500 parts of cowpeas gave protection, while only half as much sodium fluosilicate was all that was necessary against the bean weevil.

CONTROL OF TOBACCO INSECTS

The experiments with the tobacco flea beetle and tobacco hornworm were continued on a more extensive scale in 1934. Among the different materials tested, including lead arsenate, calcium arsenate, natural and synthetic cryolite, Dutox, and paris green, the last was the only one to show serious foliage injury.

Flea beetles were most successfully controlled by Dutox or calcium arsenate. Against the tobacco hornworm, lead arsenate was slightly better than calcium arsenate. In view of the freedom from foliage injury, the elimination of residual lead, low cost, and high efficiency in the control of both flea beetle and hornworm, the most satisfactory insecticide for dusting tobacco appears to be calcium arsenate.

THE MORE IMPORTANT INSECT PESTS OF 1934

During the year 1934, requests were received for information on the insects listed below.

Imbricated snout beetle (*Epicaerus imbricatus*).—This insect, on April 18, seriously injured a newly-planted cantaloupe field that was previously in alfalfa. The life-history of the pest is not fully known. We were unable to determine whether it breeds in alfalfa or some weed common in alfalfa fields. Hand-picking and replanting enabled the grower to get a stand of melons.

Tarnished plant bug (*Lygus pratensis*).—Potatoes were seriously injured by this insect on the Cumberland Plateau. It seemed to be prevalent in alfalfa fields, and when the alfalfa was cut, the bugs transferred their activities to adjoining potato fields. Injured plants appear as though they were wilted at the top. Laboratory tests indicated that these bugs can be killed by derris.

Bean beetle (*Epilachna corrupta*).—Due to the abundance of moisture, the bean beetle staged a real comeback and was about as destructive as in 1923, when it first arrived in Tennessee.

Blister beetle (*Epicauta Pennsylvanica*).—This insect was reported from Morgan County as seriously damaging irish potatoes. Dutox was advised as a control measure.

Army worm (*Cirphis unipuncta*).—At Jonesboro, the army worm appeared on corn, small grains, and grasses.

HOME ECONOMICS

Florence L. MacLeod

I. VITAMIN A CONTENT OF DIFFERENT VARIETIES OF SWEET POTATOES

During 1934, studies dealing with the vitamin A content of the Triumph and Southern Queen varieties of sweet potato were completed. The Triumph variety was found to contain 2 units per gram, or 900 units per pound, and the Southern Queen, 4 units per gram, or 1800 units per pound.

The work on the vitamin A content of the Nancy Hall, Porto Rico, Yellow Jersey, Triumph, and Southern Queen varieties was written up in a form suitable for publication in a scientific journal.

II. VITAMIN G CONTENT OF VEGETABLES

Considerable time was spent during the year in studying the method for determining vitamin G and in assembling apparatus for use in the preparation of the diet. Determinations of the vitamin G content of cabbage and sweet potatoes have been made. More experiments will have to be carried out before the vitamin G content of these two vegetables can be definitely stated.

HORTICULTURE

Brooks D. Drain

RED RASPBERRY IMPROVEMENT

About 400 red raspberry seedlings of known parents were fruited the past season, and 26 were selected as worthy of further study. In general, Viking crosses averaged high in quality, but the fruit was only of medium size. Plantings of the more promising new varieties from our breeding plots have been made at the Mericourt and West Tennessee Stations.

Between 3,000 and 4,000 seedlings of the 1933 crosses were set in the field, and many of them will fruit in 1935. Seed from the 1934 crosses are in storage and will be planted early in 1935.

STRAWBERRY IMPROVEMENT

From over 7,000 strawberry seedlings that fruited the past season, 150 superior ones were selected. Several self-pollinated seedlings were promising as breeding stock, but most plants from this line of breeding were not superior in either fruit or plant characters. The hybrid seedlings gave a high per cent of promising selections. About 5,000 seedlings of known parentage will fruit in 1935. Similar plantings of new crosses were set in November and should fruit in 1936.

The selections were made on the following basis: Summer hardiness, freedom from foliage diseases, ability to make runners, dessert and shipping qualities of fruit, yield, and appearance. A

series of trials were started on the value of these selections for freezing purposes.

Blakemore has been seriously affected by a foliage trouble of undetermined cause. This trouble resembles a mosaic disease and has been observed in many parts of the State, as well as at Knoxville. Rogueing young plantings and setting plants that are as free from disease as possible are the most promising methods of control. A spacing test of this variety indicates that about 5 inches between runner plants will give the maximum yield in both quality and quantity of fruit.

Dorsett and Fairfax are the most promising of the newer U. S. Department of Agriculture seedlings. Their yield, size, and quality of fruit were excellent. Some plants of the latter variety suffered severely during dry weather in midsummer. Plantings of the most promising varieties from these trials were made at Jackson and Clarksville.

FIRE BLIGHT

Fire blight-resistant pear selections from the 1931 crosses which had been top-worked into bearing pear trees made a nice growth this past season and should fruit in 1936. Resistant selections from crosses previous to 1931 have been planted in various parts of the State. Many of these trees have now fruited, but the fruit is low in quality. The spring of 1934 was unusually favorable for pear breeding. Most of our crosses were very successful, and between 3,000 and 4,000 seeds from this work are now in storage.

The Lodi apple blighted badly in the nursery row.

ROOT-KNOT NEMATODE

Efforts to control nematodes by the use of chemicals were continued. Calcium cyanamid, a nitrogenous fertilizer, failed to give a satisfactory kill on clay soils. This was the second season that this material had been tried. The pest was found in many home gardens in certain parts of the State and appears to be causing serious damage. Two species of Crotolaria ripened seed this past season. None of the species under trial developed root knots on infested soil.

FRUIT STOCKS

A comparison of Mazzard and Mahaleb cherry stocks was started in 1930. At the end of 4 seasons' growth, Montmorency had not developed any roots above the bud union, although planted at various depths. Coe's Transparent sweet cherry on Mahaleb developed roots above the bud union on over 78 per cent of the trees. The roots were identified by the iron-alum method.

PLUMS

Methley, a plum from Africa, produced a large crop the past season. This variety blossoms early and should not be planted in frosty locations. It is especially promising for home plantings, as it appears to be resistant to brown rot.

PYRETHRUM

Selected high-test strains of pyrethrum from Mericourt and Knoxville Stations were propagated by crown division. A single plant having blossoms that analyzed high in total pyrethrins was propagated vegetatively in 1932, and the air-dried blossoms from its progeny plot analyzed 2.05 per cent the past season. This is the highest-testing strain found to date.

TRUCK CROPS

Rhubarb.—Efforts to develop crown rot-resistant rhubarb were continued, seed from Japan and other foreign countries being used.

Irish potatoes.—Chippewa appears to be the most promising of the U. S. Department of Agriculture seedlings tested to date for the spring crop. The tubers averaged better in quality than Katahdin. A small amount of curly dwarf was rogued out of the Jersey Redskin planting. This variety continues to give the largest yields in the fall-crop varietal trials at all stations.

Sweet corn.—A varietal trial of recent introductions from the breeding work of many stations was made the past season. A selection secured from L. S. Mayer, of this Station, ranked high in yield and freedom from worm injury. While it would not be called a sugar corn, it was tender and of good quality. Surecropper, a variety from the Texas Station, developed large ears and was severely injured by worms. The cob was large and quality only medium. Golden Cross Bantam showed good quality, gave a good yield, and was only moderately injured by worms. Tendergold was about the equal of Golden Cross Bantam.

IRRIGATION FOR LATE VEGETABLES

The work on irrigation for late vegetables was ruined the past season by a severe outbreak of nematodes.

ORNAMENTAL PLANTS

Two new plants attracted attention in the Foreign Plant Introduction plots. A perennial verbena from the Orient produced violet-blue blossoms in August and September. The plants are two years old and about 3 feet tall. An Hypericum received from France bloomed the past summer, producing attractive yellow flowers.

A varietal trial of French lilacs continued to attract considerable attention. The stock is privet, and they have been blossoming for several years. Many of the varieties develop a few fall blossoms. This planting has been reasonably free from summer foliage injury for several years.

PLANT PATHOLOGY

C. D. Sherbakoff

The studies in plant pathology during the year have been devoted primarily to the projects previously organized, with one new project, that of black root rot of apples, being added. Considerable attention must inevitably be given to the need of public organiza-

tions in the State, and of individual citizens, for assistance on plant pathological problems.

Below is a brief statement of the progress made on each of the projects that were active during the year.

WHEAT HEAD BLIGHT AND ROOT ROT

The work with wheat head blight and root rot is concentrated upon an effort to secure wheats suitable for local culture that are also resistant to these diseases. The year's test of the yields of the oldest 12 best wheat selections showed that only two of them, Tennessee 2 and Tennessee 4, have appreciably outyielded the check, C.I. 2008, considered our best-yielding wheat; the yields of the two varieties being 23 and 28 per cent higher. One of the other selections, Tennessee 80, while it yielded this year about 8 per cent less than the check, possesses important merits, and therefore has been retained for further trial. The other more recent selections, 226 in all, were each represented by progenies of 10 single-plant selections, planted in 8-foot rows, one row to each. Ninety-eight were selected as promising. These, together with 12 older selections and 6 of the best standard varieties, were planted, in October, 1934, in 100-foot rows, to be used for general observations and especially for artificial inoculation with head-blight fungus and the bacteria causing glume rot. At the same time there were planted, in 15-foot rows, 202 progenies of additional single-plant selections and progenies of 35 hybrids. Some of the better selections were planted, on a small scale, in Bristol, Gallatin, and Martin areas, for observation of the effect of local conditions upon the wheats selected at Knoxville.

FUSARIA CAUSING WILT OF ECONOMIC CROPS

During the year, besides the necessary attention to routine work with numerous old cultures of Fusaria, new isolations were made from a large number of different host plants, especially from cotton, sweet potatoes, watermelons, irish potatoes, and tomatoes, and from many different soils. J. K. Underwood has been occupied principally with this phase of the work, while G. M. Stone devoted most of his time to field studies of the effect of environment upon the development of cotton wilt and sweet potato stem rot in West Tennessee.

STRAWBERRY BLACKROOT

Work in the field, on strawberry blackroot, has consisted primarily of the testing, at Portland, of a number of promising strawberry seedlings and crosses under conditions favorable for the development of blackroot disease.

APPLE BLACK ROT AND OTHER PREVAILING DISEASES

Spraying tests, by J. O. Andes, for prevailing diseases of apple, again showed that under usual weather conditions all of the diseases of our standard varieties of apples are economically controlled when the trees are properly and thoroughly sprayed, at the right time and with the right fungicides. In the cases of black rot

and bitter rot, the spraying must be supplemented by certain sanitary measures, such as removal of dead wood, treatment of cankers, and prompt destruction of rotten fruit and mummies; and the trees should be properly pruned and spaced and weeds kept down to permit sufficient air movement. Most of our standard varieties of apples differ materially in their susceptibility to diseases, and the spraying should be modified accordingly. Our recommendations for control of these diseases have been worked out on the basis of spraying tests and are available in circulars of information. Since our experiments under this project have given us the needed information, they are being discontinued.

APPLE FIRE BLIGHT

The work on control of fire blight was limited to spraying, by J. O. Andes, with weak bordeaux, 1-3-50, when about half the blossoms on the trees were open. In the test there were 5 trees of the Red Delicious variety. About 6 weeks later a careful count was made of blighted and blight-free clusters on the 5 sprayed trees and on one unsprayed which was a fair sample of the other unsprayed trees. The data obtained are shown in the table.

Effect of spraying, in 1934, near Knoxville, with 1-3-50 bordeaux mixture, on Red Delicious apple trees when about half of the blossoms were open.

Tree No.	Treatment	Blight-free clusters	Blighted clusters	Per cent of clusters free from blight
1	Sprayed	425	25	94.5
2	Sprayed	360	15	95.8
3	Sprayed	430	23	95.0
4	Sprayed	760	17	97.8
5	Sprayed	366	11	96.8
6	Unsprayed	204	138	59.0

COTTON VERTICILLIUM WILT

The selection of cotton strains showing apparent resistance to Verticillium wilt was continued, with the assistance of Mr. Stone. This season we were able to obtain more definite records of the rate and time of appearance of the wilt in different single-plant progenies of previously selected plants. Thus, actual counts were made of the number of plants showing external symptoms of the wilt early in the season, in the middle of the summer, and toward the end of the season. The plants showing the symptoms were pulled out as soon as recorded. At the end of the season the plants that were free from external symptoms of wilt, and hence apparently healthy, were examined for the presence of an internal symptom—the internal discoloration of the stems. On the basis of this examination the plants were divided into 3 groups—those with bad discoloration, those with slight discoloration, and those with no discoloration. In order to map the data and to present them in equivalent values, a formula of wilt susceptibility coefficient (Ws) was worked out on the following basis:

$Ws=(4a+2c+1d):(2e+4f)$, where

a = the number of plants pulled early in the season
b = the number of plants pulled in the middle of the season
c = the number of plants pulled at the end of the season
d = the number of plants without external symptoms but with bad discoloration
e = the number of plants with slight discoloration
f = the number of plants with no discoloration

MERICOURT EXPERIMENT STATION

FIELD CROPS

H. P. Ogden

Five new crop rotation and fertility experiments were added to the work at Mericourt Station. The principal variable is the kind of legume used, such as red clover, alfalfa, sericea, Korean lespedeza, or Kobe lespedeza. The rotations are all 5-year rotations, with corn and tobacco grown the fifth year to measure the efficiency of the different legumes in maintaining or increasing fertility. Each year of each rotation is represented every year. All plots of all rotations receive equal amounts of phosphate, but there is one series receiving potash and one without potash. The influence of lime on these various legumes is also included in this experiment. Other fertilizer experiments were continued as in the past.

A test was made of the effect on subsequent seed yields of cutting annual lespedeza at various stages of growth. On the poor land used in this experiment the largest yields of seed were made where no hay was cut. Lespedeza cut for hay two weeks before blossoming produced more seed than that cut at later stages of maturity. Growth was so poor that seeds were produced below the level of the cutter bar of the mowing machine, even on the plots that were cut for hay after the seeds were beginning to turn brown.

Methods of seeding sericea were tested, including the use of both scarified and unscarified seed, sown both alone and with wheat, during the winter, spring, and summer months. Best results were obtained where unscarified seed was sown in wheat in January. Scarified seed gave best results when seeded in March.

Varietal trials of corn and of lespedezas were continued.

HORTICULTURAL CROPS

Brooks D. Drain

Following is a summary of the horticultural work at Mericourt Station, Clarksville:

Sweet potatoes.—The varietal trials of sweet potatoes were transferred to fertile soil and the crop was unusually good. The Vineless Yellow Jersey produced the largest yield of U. S. No. 1 potatoes. Jerseys are preferred on northern markets, and this variety has possibilities for that purpose.

Pyrethrum.—This new crop has thrived at Mericourt, where the soil is low in humus and has good drainage. The high-test strains

developed in cooperation with the Knoxville Station have greatly increased the value per acre of the dried blossoms.

Red raspberries.—The mulched plots made a better growth and yielded nearly twice the fruit when compared with cultivated plots. St. Regis gave the largest yield per acre. Foliage diseases caused many leaves to drop.

Asparagus.—Calcium cyanamid applied at the rate of 400 pounds per acre in a 24-inch strip over each row killed a heavy stand of chickweed. This weed-killing test has been made for two seasons without apparently injuring the asparagus shoots. The soil was very fertile, and this nitrogenous fertilizer has given only a small increase in yield over the unfertilized plots.

Irish potatoes.—Katahdin gave a smaller yield than Irish Cobbler in the spring-crop plots. The Jersey Redskin fall crop was unusually good—over 97 per cent marketable—and the yield was large. The plots in which the plants were about 10 inches apart gave larger yields than those with wider spacings.

Rhubarb.—Some of the more promising plants were dug and crown-divided for a planting at the West Tennessee Station.

Ornamental shrubs.—At the end of the first season's growth crepe myrtle, *Lagerstroemia indica,* had made a good growth on the lime plot and all but one plant died on the acid soil. Mountain laurel, *Kalmia latefolia,* gave an opposite response.

MIDDLE TENNESSEE EXPERIMENT STATION

L. R. Neel

FARMING OPERATIONS

As an indication of the extent to which row crops have been reduced at the Middle Tennessee Experiment Station, it may be mentioned that the amount of corn harvested for grain in 1934 was only 10 acres. Approximately 17 acres was devoted to corn and sorghum mixed for silage and one acre of the farm proper was in tobacco. The remainder of the 652 acres was sown in small-grain crops, hay, and pasture. A total of 95 acres was devoted to either alfalfa alone or alfalfa and orchard grass mixed. Surplus amounts of small grain were sold for seed purposes and the proceeds were invested in corn for feeding.

A successful silage combination.—The silage combination used at the Middle Tennessee Station the past two years has been an ordinary stand of Huffman corn and, drilled in same row through a separate box, 2½ pounds to the acre of clean seed of Texas seeded ribbon sorghum. This crop, planted from the first to the middle of May, has been ready to harvest the middle or latter part of September, the corn and sorghum coming off very nicely together. All other varieties of corn tried with the ribbon sorghum have matured too early, and for that reason the Huffman variety was tried. The season of 1934 was at least normal for growing silage, and the yield on the 17 acres averaged about 20 tons to the acre.

A silage of excellent quality was made from the combination crop.

Small grain seeded on disced sod land.—September had good rains, and opportunity was taken to disc sods in several places where the bluegrass had thinned out as the result of drouthy seasons. By running the tractor disc over the sod lands once or twice and following with harrow and cultipacker, a fair seedbed was made for small grain and for grass. Portions of the land thus prepared were sown, respectively, to Fulghum oats, barley, and rye, and to a grass mixture alone. The grass mixture was also seeded with each of the three kinds of small grain. Clover is to be seeded in the spring. Growth of these grain crops in the fall was good, and at least a fair stand of the grasses was secured. Final results in animal-unit pasture days per acre for each of the small grains, and the stands of grass and clover secured in each case, will determine the merit of this practice for the season of 1935. If results are encouraging, the test will be repeated. Costs of preparation and of seedings have been computed.

Similar seeding was made in bermuda sod, but 3 discings with tractor disc were necessary, and up to the close of 1934 the growth of rye had been slight. However, spring rye pasture and the increased growth of bluegrass, white clover, and hop clover in the bermuda sod may pay costs with profit.

Rye.—Continuation of varietal trials with rye still leave Balbo in the lead, not only as a pasture, but also in grain production. Indications point to mid-fall seeding and a moderately low rate of seeding for best results in grain yield, but to seedings from the middle to the last of September at a rate of not less than 2 bushels per acre for pasture.

Wheat.—Forward wheat again leads all smooth varieties, and comes within one-fifth bushel of the highest-yielding bearded wheat. Nitrate of soda was used as a top-dressing on wheat in the spring with excellent profit.

Barley.—The first season of a barley-pasture experiment was completed in the spring. One of 4 plots was not pastured, stock were taken off one plot early, one at medium date, and one at late date. The different plots were credited with pasture days and gains, and barley was harvested and threshed for grain yields. The test will be continued for a total of at least 4 years, the plots being rotated.

Distribution of seed among farmers.—Seeds sold to farmers at moderate prices in 1934 included 295 bushels of No. 52 barley, 244 bushels of Balbo rye, 140 bushels of Fulghum oats, 18 bushels of Forward wheat, and 750 pounds of hop clover, *Trifolium procumbens*. These are proven varieties of farm crops. An effort is made to place them with farmers who will keep them pure and save them for seed purposes.

LIVESTOCK

The livestock work is presented in the Animal Husbandry section of the Annual Report, by Dr. M. Jacob.

HORTICULTURE

The one horticultural experiment conducted during the year was a trial of source of seed potatoes for both spring and summer planting. In both tests Cobbler and Green Mountain potatoes from late crop of the Cumberland Mountain region were compared with the same varieties from Maine and the Northwest. In the late crop, Jersey Redskin, McCarty, and Spalding No. 4 were added to the test. No conclusions were reached.

WEST TENNESSEE EXPERIMENT STATION

Ben P. Hazlewood

General repair of the West Tennessee Experiment Station property was made possible through the CWA and TERA. This work included 7 projects; namely, general repair and painting of exterior and interior of all buildings; repair and rebuilding of certain fences and water gates; repair and painting of chairs and farm equipment; razing of 2 wooden silos and erection of 2 concrete stave silos; drainage and erosion control; malarial control; and cataloguing of all material in library under standard index. This work was financed jointly by The University of Tennessee, CWA, and TERA; the University supplying $2,144.00 for supervision and materials, and CWA and TERA $4,088.63 for materials and $18,043.80 for labor. Circumstances had not permitted repairs to the property during recent years, and the work was therefore greatly needed.

The Station experienced about its average visitation throughout the year. Weather conditions were generally favorable for the field experiments, except for the drouth period the first three weeks of August.

PASTURE PROGRAM

A pasture experiment with dairy cattle was begun in 1932 and a similar one with beef cattle in 1933. An effort has been made to provide all-year pasture for these experiments. Crops used for this purpose have been crimson clover, sudan grass, and a permanent pasture consisting of a mixture of bluegrass, bermuda grass, orchard grass, red top, hop clover, white clover, and lespedeza. One acre of crimson clover, one acre of permanent pasture, and one-half acre of sudan grass were provided for each dairy cow or each 1000-pounds steer weight. Crimson clover has been seeded from the last of July to the middle of August. The early seeding date provided pasture by November first each year. Sudan grass and silage follow crimson clover. This combination of crops supplied 335 days pasture during 1934, which is about the average for the two preceding years. Grain feeding of dairy cattle, fed all-year pasture and alfalfa hay, was not profitable.

WINTER COVER CROPS

Cabbage, tomatoes, and sweet potatoes after crimson clover, rye, and fallowed land, gave the following average acre yields over the 4-year period 1931-34:

Name of crop	Yield after crimson clover	Fallow	Rye
Cabbage	5.34 tons	3.96 tons	4.48 tons
Tomato	185 bu.	140 bu.	107 bu.
Sweet potato	364 bu.	282 bu.	294 bu.

Cabbage on fallowed land matured earlier than after either crimson clover or rye. Growth of cabbage after a winter crop turned in early February has been so slow that this practice would be advised against where the crop is grown for early market. Tomatoes and sweet potatoes have given very favorable response when grown after a winter legume. The response of these crops to nitrogenous fertilizers after a few years of crimson clover has not been profitable.

Crimson clover alone, or one of the combination seedings of crimson clover and Balbo rye or crimson clover and American rye grass, produced considerably more tonnage per acre than vetch, Austrian winter peas, rye grass, Balbo rye, or any combination of these. Comparisons were based on dry-weight yields taken the first of May.

VARIETAL EXPERIMENTS

A seeding of alfalfa varieties made in the fall of 1930 was discontinued after 1934 yields. The total 4-year yield for each variety is shown in the following table:

Variety	Tons per acre
Hairy Peruvian	14.28
Common Chilean	16.52
Cossack	17.32
Nebraska (common)	18.04
Ladak	15.16
Grimm	18.80
Kansas (common)	21.64

The usual extensive varietal work with field, garden, and fruit crops was continued. Several varieties were discontinued where sufficient data had been secured. New varieties were added.

CROP ROTATIONS

Several crop-rotation experiments planned for different types of farming have been in progress for more than 25 years. Various fertilizer treatments under both limed and unlimed conditions are included in each rotation. The continuation of these rotations is giving an abundance of valuable information. This type of experiment constitutes a considerable part of the field-crops work.

COTTON

The usual work was carried on with cotton. All the cotton-breeding variety and new-strains tests are included in a Purnell

project and are covered in the Botany section of this report. Fertilizer tests continued to show from 100 to 200 pounds of nitrate of soda or its equivalent to be a profitable application on medium to thin lands. The need for potash on gray or white lands was further emphasized. The response to phosphate has been less regular. Complete fertilizer recommendations may be had from Experiment Station Circular of Information No. 23. Soil-preparation experiments with cotton show very little difference in results from early and late preparation or 6- and 3-inch depths of plowing. Planting on level and list gave about the same results. Extensive tillage results have been previously reported.

HORTICULTURE

Sweet potatoes.—A number of stem-rot-resistant selections were secured from the U. S. Department of Agriculture breeding work. Mameyita and one or two other seedlings have commercial possibilities if they continue to show resistance to this disease.

Tomatoes.—All varieties gave exceptionally large yields. Break O'Day ripened fruit somewhat earlier than the other varieties. Tennessee Pink, a wilt-resistant variety from the Knoxville breeding work, compared favorably with the best.

Early cabbage.—Golden Acre made a good showing in the cabbage plots.

Okra.—Mammoth Long Pod and Dwarf Green Pod came into bearing early and gave large yields in these varietal trials.

Irish potatoes.—A 6-inch spacing gave the largest yields in the spring-crop plots. All varieties gave low yields in the late crop, with Jersey Redskin making the best crop.

Asparagus.—Planting at a depth of 5 inches gave the earliest and largest yields. This crop was the first from a new planting.

Bush beans.—Tendergreen compared very favorably with Giant Stringless Green Pod in this varietal planting.

Lima beans.—The large seeded varieties gave somewhat smaller yields than Sieva.

Peaches.—A nice crop of peaches were harvested the past season. A number of new varieties and strains were set in the new peach planting.

Strawberries.—Pearl continued to be the best among a number of late-ripening varieties.

Pears.—A number of seedlings from the Knoxville breeding work blighted the past summer.

Gooseberries.—Glendale, a new variety of gooseberry, appears to be well adapted to this section.

Grapes.—The grape varietal planting at this Station was made many years ago. Many plants are missing, and some of the varieties have now been discarded. There are 16 varieties in this planting. Moore is the best early-ripening blue grape on fertile soils. Concord, a blue- or black-fruited variety, and Niagara, a

green or white, are best for midseason. Catawba, picked from September 1 to 17 this year, is the best late-ripening sort.

Apples.—Pruning, soil management, and fertilizer tests have been started in the apple orchard and will need to be carried on for a period of time to show results.

TOBACCO EXPERIMENT STATION

Frank S. Chance

The growing season was fair at the Tobacco Station, Greeneville, with the exception of a severe hail storm on June 1, which nearly destroyed the wheat, barley, and rye crops. The tobacco had all been transplanted to the field, and the storm decreased the stand by about 20 per cent. This, combined with a heavy August rainfall, caused a good growth but poor quality of leaf.

The warm, rather dry, June was unfavorable to the development of black root rot in tobacco; however, in the varietal tests, on badly infested soils, those varieties most susceptible to the disease showed serious injury. In fact, of the 16 strains being tested, 7 showed much injury, and some of the others were slightly injured.

This is the second year of a test in which Judy's Pride is being compared with Johnson's Root Rot Resistant (Standup), on limed and unlimed soil. On the limed soil Judy's Pride was injured by the disease, but the unlimed soil produced a healthy growth of this variety. Johnson's Root Rot Resistant (Standup) produced a normal, healthy crop on both limed and unlimed soil. The quality of leaf from the Judy's Pride plots was much better than that from the Johnson plots.

A tobacco rotation test was initiated consisting of 150 plots of 1/50 acre each. One series of these is devoted to a 2-year rotation, one to a 3-year rotation, and one to a 4-year rotation. Many of our common crops and also weeds are being used in these rotations.

With the help of CWA and TERA, three buildings have been constructed. The first was a combination work-stock and agronomy barn. This structure is 34'x66' and is 33' high. It has a concrete foundation and floor, and the hay loft will accommodate 50 tons of loose hay. The ground floor is divided so that we have a feed room, a harness room, 5 box stalls, and a work room 34'x36'. The work room is for fertilizers and seeds. The second building erected was a cattle barn. It is 36'x60' and rises 36'. It also has 2 shed rooms, each 12'x12'. It was planned to house 20 cows and their calves up to one year old. The third structure is a combination tool barn, crib, and granary. The tool section is 94'x20', and the crib and granary section is 24'x24'6". This section is attached to the long section in the shape of a T.

During the year, almost a mile of macadam road was built on the farm. A bridge, made of concrete and wood, was built across

the creek near the mule barn. The rock for these improvements was quarried and crushed on the farm. About half the rock was blasted out of fields which are to be tilled. In this way 6 acres of good land were made more suitable for the plow.

All of the rough lumber used in the farm buildings was cut from a 17-acre tract of woodland on the farm. This project is described in Agricultural Extension Service Publication 186: "A Practical Example In Farm Woods Management."

LIBRARY

Sarah C. Currell

The Experiment Station library has a collection of 10,040 volumes, an increase of 258 volumes for the year 1934. This does not include the College of Agriculture collection, which is housed in the same room and is available to Station workers.

This Station has a very valuable collection of scientific and technical journals. Around 264 are listed. Of this number, 40 are subscribed to, 75 are either donations or exchanges, approximately 60 are received from foreign countries, and the remaining 89 have been discontinued or have ceased publication. A large number of these are bound and form complete sets.

Publications are received from the 47 other state experiment stations; the experiment stations located in Alaska, Guam, Hawaii, Porto Rico, and the Virgin Islands; foreign experiment stations; the United States Department of Agriculture; and the various state departments of agriculture.

The only satisfactory way for a library to preserve its collection is to have its material bound. This year 175 volumes have been prepared for the bindery, bound and catalogued.

Through the FERA appropriation, the libraries of the Experiment Station and the College of Agriculture have been able to employ regularly a student who devotes 50 hours per month to library work. The librarian has thus been relieved of a large amount of routine labor, enabling her to give her time to more important phases of the work.

This year the Station library has practically completed its reorganization work. Hundreds of books and serials have been checked, catalogued, and placed on the shelves. The catalogue department of the library of The University of Tennessee is responsible for this most valuable piece of work. This material, which has been for a long time inaccessible to its workers, has now been made usable.

This library serves the staff members of the Station and its substations, the faculty and students of the College of Agriculture, the Junior College at Martin, the Agricultural Extension Service, The Tennessee Valley Authority, and any research worker needing assistance.