1905

Eighteenth Annual Report of then Agricultural Experiment Station of the University of Tennessee for 1905

University of Tennessee Agricultural Experiment Station

EIGHTEENTH ANNUAL REPORT

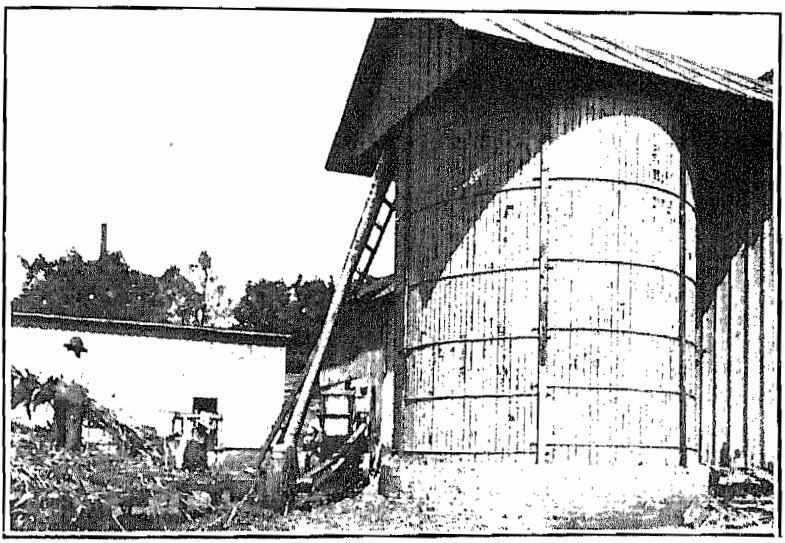
OF THE

Agricultural Experiment Station

OF THE

UNIVERSITY OF TENNESSEE

FOR 1905



FILLING THE NEW SILO WITH GASOLINE ENGINE POWER

KNOXVILLE
UNIVERSITY OF TENNESSEE PRESS
1906

The Agricultural Experiment Station

OF THE UNIVERSITY OF TENNESSEE

The Station has facilities for analyzing fertilizers and cattle foods; for testing milk and dairy products; for examining seeds with reference to their purity or germinating power; for identifying insects, grasses and weeds; and for investigating insect enemies and diseases of fruit trees, grains and other useful plants.

Packages by express, to receive attention, should be prepaid.

All communications should be addressed to the

AGRICULTURAL EXPERIMENT STATION,
Knoxville, Tennessee.

☞The Experiment Station building, containing the offices and laboratories, and the plant house and part of the Horticultural Department, are located on the University campus, 15 minutes walk from the Custom House in Knoxville. The experiment farm, the barns, stables, dairy building, etc., are located one mile west of the University, on the Kingston pike. The fruit farm is adjacent to the Industrial School and is easily reached by the Lonsdale car line. Farmers are cordially invited to visit the buildings and experimental grounds.

Bulletins of this Station will be sent, upon application, free of charge, to any farmer in the State.

LETTER OF TRANSMITTAL

KNOXVILLE, TENN., January 15, 1906.

To His Excellency, John I. Cox, Governor of Tennessee:

SIR:—I have the honor to submit 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 1905. This report is submitted in accordance with the requirement of the law that the Board having direction of the Experiment Station should annually submit to the Governor of the State a report of its operations and expenses.

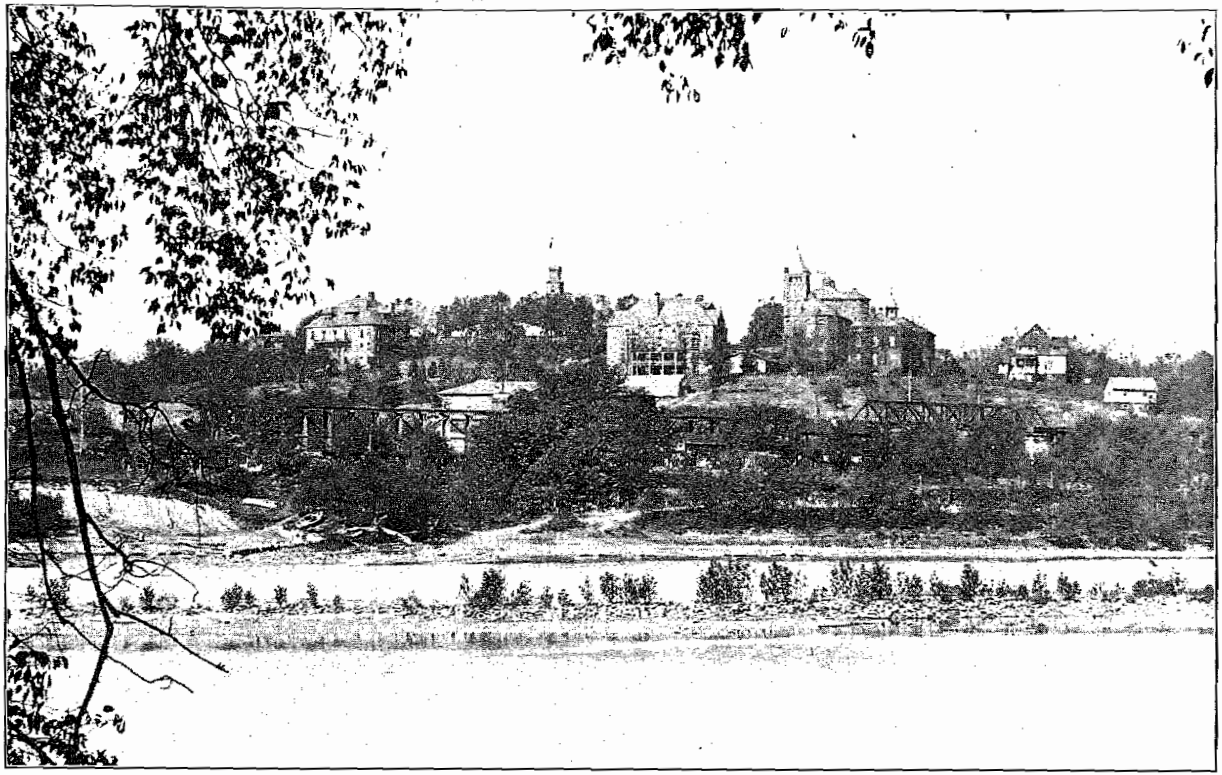
During the past year most excellent work has been done by the director, Prof. H. A. Morgan, and his associates. Very satisfactory progress has been made along various lines of investigation, and the material equipment of the Station has been greatly improved by donations and by purchase. The most cordial relations have existed between the State Department of Agriculture and the University in all its departments, and, thanks to the opportunity offered by Commissioner Ogilvie, most of the agricultural staff have, by participating in the institutes conducted by him, been able to reach the agriculturists in the State in a way for which no provision is made by the Congressional grants to the Station.

I beg to call attention to the indications of the needs of the Station by the director and his associates and to express my hope that Tennessee may speedily follow the example of other states in providing such funds as will enable the fullest benefits of the Station to be extended to the farmers of all sections of the State by the establishment of branch stations, by cooperative experiments with farmers, by personal visits, by publication of bulletins of instruction, and in other ways.

Very respectfully,

BROWN AYRES,

President.



View of the University from Across the Tennessee River

REPORT OF THE DIRECTOR

To President Brown Ayres:

The policy of the Experiment Station for the past year has been largely the same as that of former years. My predecessor, Professor Soule, during his five years' administration, did effective service, with the limited funds available, in organizing and equipping the Station for agricultural investigation. Professor Soule's aggressive agricultural spirit did much to arouse an appreciation of the value of research to the agricultural interests of Tennessee. His services to the State will always be remembered by those who are interested in its material development.

Changes in the staff

A reorganization of the Station was made necessary by the resignation of Professor Soule, Mr. Fain, and Mr. Vanatter. Mr. C. A. Mooers, who has been for many years chemist of the Station, devoting much time to soil, fertilizer, feed-stuff, and field investigation, has been placed in charge of agronomy. Mr. Walter H. Brown, assistant chemist, resigned July 1, and Mr. W. E. Grainger, a graduate of the University of Tennessee, formerly assistant state chemist of Mississippi, and for several years analyst for manufacturing companies, was made associate chemist on the same date. Mr. G. M. Bentley, a graduate in the agricultural department of Cornell University, and formerly assistant state entomologist of North Carolina, was elected assistant zoologist and entomolgist July 1. Mr. J. Howard Sledd, editor of the *Industrious Hen*, and an expert poultryman, was placed in charge of the Poultry Department of the Station November 28.

Mr. J. E. Converse returned to the Station April 1, after an absence of one year, to fill the position of plat assistant under Mr. Mooers.

Field experiments

The lines of field and plat experiments have been greatly enlarged. Variety, fertilizer, and rotation tests have been instituted upon various soil areas. These investigations have been planned for a series of years in order to reach definite and permanent results in connection with fertilization, rotation and soil preservation.

Clover diseases

For many years red clover has partially or wholly failed in the greater part of the State. This failure has been assigned to all sorts of causes but has usually been denominated as "clover sickness." The importance of the red clover crop to the rotation systems and soil fertility of the State is well recognized, and the failure of this plant has meant serious loss to the general agricultural interests. Early in the year Prof. S. M. Bain, botanist of the Station, and his assistant, Mr. S. H. Essary, began an earnest investigation of the so-called clover sickness. During the summer identifications were made of the various forms of fungous diseases, and one, an anthracnose not previously described as an enemy to clover, was found in unusual abundance. Its general distribution and its characteristic effect seem to indicate early

in the investigations that the failure of red clover in the State has been due mainly to this disease. Professor Bain and Mr. Essary covered much of Tennessee in their investigations and were materially assisted by the active cooperation of the farmers. The following article, by Professor Bain and Mr. Essary, regarding the diseases affecting clover, appeared in *Science* for October 20, 1905:

"A PRELIMINARY NOTE ON CLOVER DISEASES IN TENNESSEE

"For a few years past there has been considerable complaint among Tennessee farmers of the failure of the red clover crop. A careful investigation of the question was begun by the botanical department of the Tennessee Experiment Station early in the present season, and a short account of the present stage of these investigations may be of some interest.

"While the whole State has been more or less explored with reference to diseases affecting clover, the immediate region about Knoxville has been more carefully studied, and may be assumed as typical of the situation throughout Tennessee, and perhaps adjoining states.

"The crop begins to die in the summer following late winter sowing. The trouble has been popularly attributed to some supposed condition of the soil, and so termed 'clover sickness' of the land. It was soon learned, however, that the malady is independent of soil conditions, and there was at the outset a strong presumption in favor of some fungous or bacterial disease. Our later investigations have fully justified this opinion.

"Early in the season a few leaves were found to be attacked by the clover rust, *Uromyces trifolii* (Hedw.) Lév. This disease occurs so sparingly that it may be left out of consideration. Careful search frequently reveals the presence of *Phyllachora trifolii* (Pors.) Fckl. While this fungus caused considerable damage in some instances, it may also be left out of account.

"A rather destructive disease, apparently caused by *Macrosporium sarcinæforme* Cav.* is frequent and widely disseminated. It often appears on stray alsike plants (*Trifolium hybridum* L.) associated with the red clover, which is not true of any other parasites discussed in this paper. The *Macrosporium* disease appears capable of destroying the clover plant unassisted by any other parasite, though this statement is based only on inspection in the field.

"The most destructive disease thus far found is what appears to be an undescribed species of *Colletotrichum*. In its general appearance this disease very closely simulates the anthracnose of clover (*Stengelbrenner*) described by Mehner† and Kirchner‡ and by the latter attributed to the attacks of *Glœosporium caulivorum* n. sp.

"The *Colletotrichum* species here referred to causes considerable injury to young clover plants in early summer, where it confines its attacks to the petioles of the leaves. Its greatest damage, however, is done in

* Cited in Tubeuf and Smith, 'Diseases of Plants,' 1896, p. 517; also Milkoff, *Zeits. f. Pflanzenkr*, Bd. XII., pp. 283-285.

† *Zeits. f. Pflanzenkr.*, Bd. XI., p 193, 1901.

‡ *Ibid*, Bd. XII., p. 10.

blooming and fruiting plants, where it attacks the stems most often just below the flower heads, but frequently at other points, causing the sudden blackening and death of a limited region, eventually destroying the entire plant.

"A description and characterization of this species will shortly appear, and further experiments now under way will be described in a forthcoming bulletin of the Tennessee Experiment Station."

Every effort is being made to determine the life history and habits of this recently discovered disease, and extensive plot and field experiments, looking to remedial measures, are now being caried on.

Alsike clover

The failure of red clover has encouraged the trial and use of other legumes. Alsike clover has proved, particularly in Middle Tennessee, a valuable substitute for red clover and is being extensively used for hay and pasture. Where mules and horses have been pastured exclusively upon alsike clover some have developed sores on their heads and legs and occasionally on their bodies. Dr. Jacob, veterinarian of the Experiment Station, made some investigations of this trouble during the summer of 1905, and has made a report upon his examinations in a bulletin recently prepared upon alsike clover.

Zoology and entomology

The Department of Zoology and Entomology was organized during the year. Special study has been given to the insects of the farm, orchard and garden. Investigations of washes of possible value in the suppression and control of scale insects, particularly the San Jose scale, have been undertaken in cooperation with the Department of Horticulture. Some attention has been given to the organization of an experimental apiary, and the cooperation of the bee interests of the State has been enlisted.

Cattle tick

This Department has continued life history investigations of the cattle tick and has cooperated with the State Live Stock Commissioner in the dissemination of information regarding the pasture rotation and feed-lot systems of eradicating this pest and of reducing the quarantined area of Tennessee. The methods are outlined in Bulletin No. 1, Vol. XVIII, of this Station.

Feeding experiments

Beef and dairy and hog feeding experiments have been continued, with the view of determining economical feeding rations of home-grown products. During the administration of Professor Soule the use of corn and sorghum silage for beef and dairy cattle was carefully tested and strongly recommended. The results of feeding experiments are being compiled and will be published in bulletin form.

A new silo

An inexpensive silo was erected to use in experimenting with crops for the silo, to add to the facilities for feeding beef cattle, and to serve as an illustration of a cheap, serviceable form of silo for examination as to structure and use.

A new manure shed

The care of the manure of the average farm is becoming a question of increasing importance. To control the composition of barnyard manure used in experimental work, as well as to check the loss from exposure of

the manure pile, the Station has built a manure shed on the farm. This is so arranged that cattle may be bedded and sheltered under it. Thus is secured the tramping of the manure and its best possible protection from fermentation and loss of ammonia.

Horticulture

The Department of Horticulture has during the year increased its experimental area for the study of varieties and fertilizer combinations available for economic fruit and vegetable production. Tennessee, with its varying soils and altitudes, presents many problems in fruit culture, and some study has been given the fruit and truck areas and the conditions peculiar to them.

Nursery interests

All the nurseries of the State have been visited, and their interests studied, and in the future the Station will give considerable attention to this important branch of Tennessee's horticultural work.

Poultry

The recent establishment of a Poultry Department is in keepng with an extensive and growing interest in the poultry business of the State. Within recent years Tennessee has experienced an intelligent interest in poultry culture. Largely through the energetic efforts of Mr. Sledd, the poultryman of the Station, state and county poultry organizations have been formed and the commercial phase of this branch of argicultural work has been placed upon a stable and permanent basis. Farm poultry will receive special attention from the Station. Already several standard breeds are under test at the Station.

Correspondence

The correspondence of the Station from all parts of the State has been large. Information of all kinds is daily dispensed in this way, and through the medium of correspondence the Station has greatly enlarged its usefulness to the farmers of Tennessee.

Needs of the Station

The State has not appropriated any funds for the maintenance of the Station or for the support of investigation. Tennessee stands almost alone among the states in this respect. The departments are at present organized to the limit of the appropriations and are arranged to accomplish the most with the funds available. The demands made upon the Station are already in excess of the facilities for meeting them. The buildings are inadequate, and limit investigation. Departments long established are crowded for room, and new departments are without permanent quarters.

The possibility of greatest achievement in agricultural work in Tennessee is practically out of the question without a wider and more accurate knowledge of the soil areas of the State. Daily we are in receipt of letters asking for information based upon soil investigations which is not available. Nothing just now is of more importance to the general agricultural interests of the State than soil investigations, and the Station should have liberal appropriations from the State to accomplish this work satisfactorily. Appropriations for the investigation of animal and plant diseases, insect pests, soils, fertilizers, and feed-stuffs; for the purchase and maintenance

of an experimental beef herd; and for further development of present departments, are essential in the interest of changing conditions and better agriculture.

Cooperation

The members of the Station staff have cooperated with the State Department of Agriculture in institute work in West and Middle Tennessee. The Commissioner of Agriculture has been exceedingly helpful to the Station operations and has been the means of placing the work of the Station in closer relation with the farmers of the State.

The Department of Agronomy is cooperating with the U. S. Department of Agriculture, Bureau of Plant Industry, in cereal experiments, and Professor Bain, botanist of the Station, is still cooperating with the Bureau of Plant Industry in cotton breeding and selection in connection with the Mexican cotton boll weevil investigations. Some cooperative work has been done with the U. S. Department of Agriculture, Bureau of Entomology, in incubation and life history work on the cattle tick.

Acknowledgments

It is a pleasure to acknowledge the kindness shown and support given me by the president of the University and the members of the Station staff. The responsibilities of the work have been lightened, conditions have been more easily studied, and efficient organization more effectively maintained, by the kindly and earnest support given me.

Respectfully submitted,
HARCOURT A. MORGAN, *Director.*

REPORT OF THE BOTANIST

As announced in the last annual report of the botanist, the chief line of work pursued during the past year has been the investigation of the cause of the failure of the red clover crop in Tennessee.

Early in the year circular letters were sent to various farmers as to the character and extent of the malady in question. Much valuable information was gathered in this way.

Early in June of 1905 the disease made its appearance in various sections of the State, and field and laboratory studies were actively begun at once by the botanist and his assistant, Mr. S. H. Essary. Several fungous diseases were found to be more or less prevalent, most of which were well-known to plant pathologists. While these produced considerable injury in some instances, they were insignificant as compared with a new and hitherto undescribed disease caused by a fungus belonging to the genus *Colletotrichum*. This disease was found to be practically the only cause of the death of the clover in every region examined, after an extensive field survey of much of the State, and the conclusion was reached that this new anthracnose is the chief cause of the failure of the clover crop in Tennessee. Of course future investigations may bring to light other diseases associated with it, but enough observations have been made to justify the above statement. A preliminary report on this work was published in *Science*, October 20, 1905, (see page 52 of this report).

Experiments are now under way looking toward a thorough study of the life history of the fungus causing this disease, and extensive experiments have been begun with the hope of finding a remedy for the trouble. In addition to the above-mentioned paper in *Science*, a popular account of the subject is soon to appear in a publication of the State Department of Agriculture.

In addition to the definite line of investigation above mentioned, this Department has been for a number of years gradually accumulating specimens and data relating to the flora of Tennessee. In this way the collection and notes have come to be a sort of library of information on the distribution of the native species of Tennessee plants, the various useful and ornamental trees, shrubs, etc., the medicinal plants, the noxious weeds, valuable grasses and other native forage plants, and many other features too numerous to mention. A considerable collection of such species was made in Fayette County the past year and filed away as a permanent acquisition. It is hoped eventually to accumulate much valuable information as to the soil distribution of our native plants, and thus to make this Department of growing importance to the agricultural interests of Tennessee.

The distribution of certain noxious weeds, such as the wild onion, Johnson grass, dodder, etc., is becoming a serious menace to certain lines of agriculture over parts of this State. Many of these weeds are distributed as impurities in commercial clover and grass seeds. The Station has for many years undertaken to test seeds for germinating power and impurities when sent in by farmers of the State. This is still done by this Department, but if any considerable number of farmers should avail themselves of this offer it would be impossible with our present facilities to do the work. The importance of legal inspection of agricultural seeds for purity and germinating power is emphasized by information in possession of the Station. In some cases, for example, farmers have sown Canadian blue-grass seed for Kentucky blue-grass, and ordinary cheat for Arctic grass, only to learn the deception practiced upon them after the seed came up and grew to maturity.

By arrangement with the Experiment Station and the Department of Agriculture at Washington, the botanist devotes part of his time each year to the breeding of cottons for earliness, general improvement, oil content of seed, etc. This investigation is under the general direction and constitutes a part of the work of the Plant Breeding Laboratory of the Department at Washington. One of the experimental plots is located near Oakland, thirty miles east of Memphis, where experiments have been in progress for over a year. No systematic effort has hitherto been made to improve native varieties of cotton in Tennessee, and it is believed that this work will ultimately be of great importance to the cotton growers of this section of Tennessee.

Several important volumes hearing especially on diseases of plants have been added to the library during the past year. A number of smaller pieces of apparatus have been purchased for the botanical laboratory.

This Department is in serious need of a greenhouse for experimental

work, and this necessity is accentuated by reason of the demands for thorough study of the above-mentioned clover disease.

This report can not be considered complete without commendation of the efficient and sympathetic aid of the assistant botanist, and of the painstaking advice and cheerful assistance of the director in all of the work of this Department.

Respectfully submitted,

SAMUEL M. BAIN, *Botanist.*

REPORT OF THE CHEMIST AND AGRONOMIST

AGRONOMY

Several additional locations for field experiments were selected early in 1905 in order to make use of other and important soil types and also to secure greater uniformity than heretofore in soil conditions. The results of the season's trials on these new areas were highly satisfactory. Variety tests of corn and fertilizer experiments were made on three distinct types of soil. Various rotation and manuring experiments have been established on two representative types. On the Experiment Station farm are at least four distinct kinds of soil, all of which are valuable for experimental purposes and are to be made use of in the coming season. These types may be briefly described as follows: (1) Sandy first bottom which is overflowed yearly; (2) loamy second bottom which was formed in part by overflow of the Tennessee River, but in probably larger part by washings from the dolomite uplands; (3) a type of dolomite upland containing but little chert and resembling the Sweetwater Valley soil of East Tennessee; (4) a cherty dolomite similar to the soils found on ridges like Blackoak and Crocketts. Type (3) fortunately resembles to a marked extent a common clay loam found in the Central Basin. Results obtained on type (4) would be applicable to the barrens and other similar areas, so that in the writer's judgment it would be difficult to find a single farm with better representative soils for experimental purposes. To increase the efficiency of the field work more extensive cooperative experiments than have heretofore been made for Middle and West Tenessee are planned.

The principal lines of field investigation now being carried out at the Experiment Station farm are as follows: (1) Variety tests with corn, sorghum, wheat and other small grains, grasses, soja beans, cowpeas, clovers, and various legumes; (2) the improvement of the most important crops by selection and breeding; (3) crop rotations; (4) manure and fertilizer experiments.

The outlook for crop improvement in this State is very inviting. Enough data have already been collected to show the high value of home-grown seed, when properly selected, for many crops. In particular certain native varieties of corn are very promising. Soil fertility problems are perhaps of the greatest importance to the farmers of this State, and are receiving the major part of the attention of the agronomist. It is also proposed to pay increased attention to the subject of farm management.

CHEMISTRY

The association of agronomy and agricultural chemistry under one head has proved to be of decided advantage. That field work should go hand in hand with laboratory work is hardly questioned. In the chemical laboratory various crops and different varieties of the same crop are analyzed. The soils where are manure and fertilizer experiments give splendid material for laboratory investigation, which is by no means being neglected.

Of late much interest has been in evidence with respect to commercial feeding-stuffs. This seems to be due to the greatly increased price of all kinds of concentrated feeds. Adulterated and unprofitable feeding-stuffs are on the market, so that a State feeding-stuff inspection similar to the fertilizer inspection is badly needed.

The analytical work of the fertilizer inspection was done during the first half of the year by Mr. Walter H. Brown, and during the second half of the year by Mr. W. E. Grainger, the successor to Mr. Brown, who resigned to accept a more remunerative position with an iron furnace. Mr. Grainger is an experienced analyst and makes a valuable addition to the Station staff.

The number of fertilizer analyses made was nearly 70 per cent greater this year than last, and a larger State appropriation will be needed in order to meet the necessary expenses of this work, for which, of course, the funds of the Experiment Station can not be legally used.

The following is a resume of the year's analytical work:

	No. of analyses
Soils	4
Fertilizers for State inspection	367
Feeding-stuffs, etc.	22
Mineral waters	6
Miscellaneous manurial materials	22
Minerals for examination	about 75

Respectfully submitted,
CHARLES A. MOOERS,
Chemist and Agronomist.

REPORT OF THE DAIRYMAN

During the past year, the experiment with soja bean hay as a substitute for concentrates in the feeding of dairy cattle was finished, and another experiment on the feeding of cowpea hay with silage in competition with a mixture of grains and silage was begun.

Other small experiments have been begun. Among these are the feeding of wide and narrow rations to dairy cows, and the using of soda for the purpose of neutralizing the acidity of the uterus to aid in getting the cows to catch. This is becoming a serious problem in this section, due, it is thought, to high feeding.

The herd is growing rapidly, and the Station will soon be able to put pure-bred Jerseys on the market. It is advisable, however, that accommodations be made for about fifteen more cows, to enable the Station to maintain a larger herd, and increase the facilities for experimental work. Another row of stalls could be put in the stables as they now stand at a comparatively small cost.

There has been no loss of cows from milk fever or any other disease during the year, and the herd is showing excellent health.

The average production of the herd during the past year was about 6000 pounds of milk and over 350 pounds of butter.

A great deal of interest is being manifested in this Department in the State, and the field for experimental work along dairy lines is growing.

Respectfully submitted,

SAMUEL E. BARNES, *Dairyman.*

REPORT OF THE HORTICULTURIST

During the year one bulletin was issued by this Department. The principal work of the year was a fertilizer experiment with sweet potatoes and tomatoes, the beginning of a variety test with 135 varieties of strawberries, a continuation of a fertilizer test with Irish potatoes, and the continuation of spraying experiments for San Jose scale.

A barn, 40 x 46 feet, with spacious loft, man's room, tool room, four stalls, and storage space for implements, was erected in the spring of 1905, and the shed barn heretofore used was converted into a cabin for the teamster.

During the month of August the farmers' institutes in West Tennessee were attended.

The severe winter of 1904-5 entirely destroyed the peach and plum crops and severely injured the grapes. A fair crop of strawberries, raspberries, and blackberries, a heavy crop of quinces, some cherries, first fruits of pears (five varieties), and two varieties of apples were gathered. The spraying work of the early spring (1905) was largely ineffective, or else the season was peculiarly favorable for the development of the scale, for the growing season closed with more scale in the orchard than ever before. An elaborate test of remedies for scale, in cooperation with the entomologist, has been planned, and is now in course of execution.

An interesting study of apple stocks resistant to woolly aphis was begun, and observations the first year showed Northern Spy 50 per cent clean, Springdale and Champion all infested. All three varieties were claimed to be very resistant to this pest. The study will be continued and the investigation elaborated.

Respectfully submitted,

CHARLES A. KEFFER, *Horticulturist.*

REPORT OF THE POULTRYMAN

The work of the Poultry Department is yet in its infancy. Buildings have been erected and runs built to accommodate eight different breeds

of fowls, and these fowls are now in their pens. An incubator house has been erected and incubators have been installed. Brooders have also been purchased.

No experiments have as yet been carried out. The several known methods of preserving eggs will be tried, along with others that have been proposed and from which it is hoped that good results will be obtained. The feeding will be done on the basis of ratios, a combination of the feeds being made looking to the establishment of the best feed for egg production as well as that for quick development.

Respectfully submitted,

J. HOWARD SLEDD, *Poultryman.*

REPORT OF THE VETERINARIAN

Work along the lines of veterinary science in connection with the Experiment Station has until recently been very limited. During the last year, however, the scope of this work has been somewhat broadened, due no doubt to a realization of the fact that there are many conditions in this State that need investigation from a veterinary standpoint. With but few exceptions, all the infectious diseases common to domestic animals in the United States are found to a greater or less extent in Tennessee. Many of the parasitic diseases are found in this State, especially those affecting sheep. Plants which are poisonous to live stock are also prevalent in different localities. A condition in horses and mules resulting from the exclusive pasturing of alsike clover in some parts of Middle Tennessee was investigated, and as a result a bulletin was recently issued by the Experiment Station in which the various phases of that subject are set forth.

The correspondence of the veterinarian has materially increased, the letters coming from every section of the State.

It is to be hoped that improved facilities for veterinary research work will soon be obtained, for with the vast live stock interests of Tennessee at stake there is an active demand for such work.

Respectfully submitted,

MOSES JACOB, *Veterinarian.*

REPORT OF THE ASSISTANT ZOOLOGIST AND ENTOMOLOGIST

The Experiment Station has not continuously maintained a department of zoology and entomology. From August, 1888, to July, 1891, Prof. H. E. Summers held the position of consulting entomologist, and during his term of office published, in 1889, Special Bulletin A, on "The Army Worm," in 1890, Special Bulletin E, on "The Cotton Worm" and "The Hessian Fly," and in 1891, a regular bulletin (Vol. IV., No. 3) on "the True Bugs, or Heteroptera, of Tennessee." From July, 1894, to July, 1899, Mr. Chas. E. Chambliss filled the position of entomologist, publishing during this time a bulletin on "Some Injurious Insects of the Apple" (Vol. VI, No. 1), that part of Bulletin Vol. VIII, No. 1, treating of insecticides, a bulletin

on "The Chinch Bug" (Vol. VIII, No. 4), and one on "Scale Insects" (Vol. X, No. 4). From 1899 to 1905 the Station was without an entomologist. Upon the appointment of a director in 1905, the Department of Entomology was again organized, with the director as entomologist. During that year the State Board of Entomology was instituted, and the director of the Experiment Station appointed state entomologist. On July 1, 1905, the writer was elected assistant state entomologist, and assistant in zoology and entomology in the University and Experiment Station.

The work of the year has been largely one of organization. The nursery inspection work has been done under the State Board of Entomology. The cooperation of the State and Station work permits of studies and investigations of mutual value.

Several important lines of investigation have been instituted. Tests of various insecticides and investigations of the life history of the cattle tick and other farm pests, with methods of suppression, have been begun. The large bee interests of Tennessee justify the establishment of an experimental apiary, and arrangements have been made to begin this line of work.

The correspondence of the Department has been large. Many specimens of insects have been sent in for identification and for remedial suggestion.

Some cooperative work with the U. S. Department of Agriculture, Bureau of Entomology, has been arranged. The constantly increasing interest in the study of crop pests and means of controlling them promises an era of considerable usefulness for this Department.

Respectfully submitted,

GORDON M. BENTLEY,

Assistant Zoologist and Entomologist.

REPORT OF THE LIBRARIAN

The library of the Experiment Station serves also as the library of the Agricultural Department of the University, and is used by the students in that Department as well as by the members of the Station staff.

It contains now 2874 bound volumes, an increase of 199 for the year. Of this number, 26 volumes of periodicals which are subscribed for, 1 bulletin from another station, and 24 volumes of *Comptes Rendus* purchased last year, were bound by the Station; 115 volumes came from the U. S. Department of Agriculture, state experiment stations, and other institutions; 14 were purchased; and 19 were donated, 2 by members of the Station staff and 17 by Mr. James VanDeventer, of Knoxville.

A large number of reports and treatises on subjects related to agriculture have been received from miscellaneous sources in this and other countries. The papers on the exchange list number nearly 100, and include some of the best journals devoted to live stock, dairying, poultry, general agriculture, and horticulture. Many of them are kept permanently on file, although it is of course impossible to preserve them all.

The current volumes of 15 periodicals have been added to the library by subscription. A majority of these are foreign and of a technical char-

acter. They will be bound and catalogued, and used for reference by the Station workers pursuing investigations in the various departments.

The bulletins, circulars and reports of the U. S. Department of Agriculture and the state experiment stations are filed, and care is taken to keep the sets complete.

It has been decided to have the library re-catalogued, the present classification being unsatisfactory. The Dewey system, which is in use in the general library of the University, will be adopted. Work will begin the first of the coming year, under the supervision of Miss Vought, the librarian of the University. The library is somewhat crowded, and more shelf room will soon be required. The present accommodations would be inadequate if some of the books were not kept in the offices of the departments.

As in former years, the librarian has been engaged a part of his time in photographic work. During this year 118 photographs have been taken, illustrating the various lines of experimental work and the work of students in the Agricultural Department of the University. About three dozen lantern slides have been made.

The bulletin mailing list has been steadily growing during the year, 1169 names having been added since the last report.

MAILING LIST

U. S. Department of Agriculture, Agricultural Colleges and Experiment Stations	1,197
Newspapers in Tennessee	192
Exchanges	190
Farmers, Gardeners and Fruit Growers in Tennessee	5,799
Individuals in other States	473
Foreign, other than Exchanges	60
Total	7,911

Respectfully submitted,

FREDERICK H. BROOME, *Librarian.*

TREASURER'S REPORT

JULY 1, 1904, TO JUNE 30, 1905

The Agricultural Experiment Station of the University of Tennessee

IN ACCOUNT WITH THE UNITED STATES

	Dr.	Cr.
To unexpended balance on hand July 1, 1904	$ 18.34	
To United States Treasury Draft July 7, 1904	3,750.00	
" " " " " October 5, 1904	3,750.00	
" " " " " January 9, 1905	3,750.00	
" " " " " April 7, 1905	3,750.00	
By Salaries		$ 7,934.36
Labor		3,197.48
Publications		443.74
Postage and Stationery		270.63
Freight and Express		49.61
Heat, Light and Water		339.35
Chemical Supplies		171.00
Seeds, Plants, and Sundry Supplies		306.61
Fertilizers		27.00
Feeding Stuffs		306.51
Library		249.75
Furniture and Fixtures		43.57
Scientific Apparatus		743.97
Traveling Expenses		284.89
Contingent Expenses		42.50
Building and Repairs		580.13
Balance		18.34
Totals	$15,018.34	$15,018.34

This is to certify, that, as the authorized Auditing Committee of the Board of Trustees of the University of Tennessee, we have examined the accounts of the Treasurer of the Agricultural Experiment Station for the fiscal year ending June 30, 1905, and find them correct; that the above is a true balance sheet corresponding with said accounts; that the said accounts show no more than $580.13 was expended for building and repairs, and that there is $18.34 cash balance.

C. DEADERICK,
WM. RULE,
Auditing Committee.

We hereby certify that C. Deaderick and Wm. Rule are the authorized Auditing Committee of the Board of Trustees of the University of Tennessee.

BROWN AYRES, *President.*
WM. RULE, *Secretary.*

STATE OF TENNESSEE, COUNTY OF KNOX:

Before me, Thos. D. Morris, a Notary Public in and for said State and County, personally appeared the foregoing signers, personally known to me to be trustees and officers of the University of Tennessee, who made oath, in due form of law, that the above statements are true to the best of their knowledge, information and belief.

Witness my hand and official seal at office in Knoxville, Tennessee, this 20th day of November, 1905.

THOS. D. MORRIS,
Notary Public.