THIRTY-THIRD ANNUAL REPORT
FOR 1913-1914
PRESS BULLETINS—INDEX

OHIO
Agricultural Experiment Station

WOOSTER, OHIO, U. S. A., JUNE, 1914

BULLETIN 278

The Bulletins of this Station are sent free to all residents of the State who request them. When a change of address is desired, both the old and the new address should be given. All correspondence should be addressed to
EXPERIMENT STATION, Wooster, Ohio
Thirty-Third Annual Report

OF THE

Ohio Agricultural Experiment Station

For the Year ending June 30, 1914

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ANNOUNCEMENT

The Ohio Agricultural Experiment Station is organized under an act of the General Assembly of Ohio, passed April 17, 1882, and supplemented by an act of Congress, approved March 2, 1887.

WHAT THE STATION CAN DO

The Station offers its advice and assistance to the farmers of Ohio along the following lines:

- The maintenance of soil fertility, including the rotation of crops and the selection and use of manures and fertilizing materials.
- The selection of varieties of grains, grasses and forage crops and methods of culture.
- The selection of varieties of fruits and vegetables and the management of orchards.
- The examination of seeds that are suspected of being unsound or adulterated; the identification of grasses, weeds and other plants; the prevention of fungal diseases of plants.
- The identification of insects and the control of such as are injurious.
- The feeding of animals, including calculation of rations and use of various feeding stuffs.
- The planting and care of forest trees and the management of farm woodlots.

WHAT THE STATION CANNOT DO

For advice and assistance along the following lines, application should be made to the Ohio Agricultural Commission, Columbus, not to the Experiment Station.

- The analysis of commercial fertilizers, of lime or limestone for agricultural purposes, and of feeding stuffs.
- The treatment of contagious diseases of animals.
- The inspection of orchards and nurseries for the control of San Jose scale.
- The examination of foods, drugs, and dairy products suspected of being adulterated.

The Station is not prepared to analyze drinking water; requests for such analysis should be addressed to the Secretary of the State Board of Health, Columbus.

Visitors to the Station or its various test farms are welcome at all times during business hours. Persons or parties who contemplate such visits and who desire special attention are requested to write in advance, giving date of proposed visit and probable number of party.

Any citizen of Ohio has the right to apply to the Station for such assistance as it can give, and all such requests will receive prompt attention.

The Bulletins of this Station are sent free to all residents of the State who request them.

Address all communications to

Experiment Station,
Wooster, Ohio.
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Hamilton County Experiment Farm, Mt. Healthy
Victor Herron, Agent in Charge
Victor Herron, Agent in Charge

With leave of absence
In cooperation with Weather Service, U. S. Department of Agriculture.
In cooperation with Bureau of Plant Industry, U. S. Department of Agriculture.
REPORT OF THE DIRECTOR

HON. A. P. SANDLES, President of the Agricultural Commission of Ohio:

Sir:—I have the honor of submitting the thirty-third annual report on the work of the Ohio Agricultural Experiment Station, for the year ended June 30th, 1914.

INVESTIGATIONS IN PROGRESS

Following is a list of the principal subjects under investigation in the several departments of the Station.

(Investigations supported by the Adams Fund are indicated by *)

AGRONOMY

Alfalfa: 1. Different rates of seeding, ranging from 5 to 25 pounds per acre.
3. The value of disking and manuring in cleaning and renewing old alfalfa fields.

Clover: 5. A comparison of the different species and varieties of clover as to yield.
6. The duration of the different clovers when cut for hay only and when allowed to produce seed.
7. A comparison of methods and times of seeding.

8. Plant-row tests of strains of red clover grown from individual plants.
9. A study of the relation of insects of different kinds to fertilization of red clover.

Corn: 10. A test of different varieties and distinct pedigreed strains in the usual tenth-acre plot test.

11. The relation of prominent visible characters in ear and stalk to yield, viz.:
   a. Shape of ear.
   b. Length of ear.
   c. Weight of ear.
   d. Number of rows per ear.
   e. Filling of tip.
   f. Indentation of kernels.

(vii)
g. Specific gravity of kernels.
h. Height of ear on the stalk.
i. Height of plant.
j. Angle of ear.
k. Proportion of grain to cob.
l. Proportion of grain to stover.
12. The relation of previous conditions of growth to yield:
   a. As to stand.
   b. As to fertility.
13. The relation of date of planting to yield.
15. The economic value of the germination test of seed corn.
16. The testing of individual ears in ear-row work.
17. The relation of the early development of root, stem, plumule and culm in the germination box to yield.
18. The relation of care of seed corn to yield.
*19. The crossing of superior ears, as determined by previous ear-row tests, and the multiplication of pedigreed crosses in isolated plots.
*20. The effect of the isolation of superior ears, as determined by testing, in pure-line breeding.
22. A test of 14 varieties of corn for silage.
23. Thick and thin drilling of silage corn, ranging from 4 to 12 inches in rows 42 inches apart.

25. Field peas and oats at three different rates of seeding; also oats and hairy vetch.
26. Combinations of the following forage crops: Soybeans and cowpeas; soybeans and hairy vetch at several different rates of seeding; sweet clover and hairy vetch; cowpeas and sorghum; silage corn and soybeans, and flint corn and soybeans.
27. A variety test of mangels and sugar beets.
28. A variety test of millets, including Sudan grass.
29. A variety test of the sorghums.
30. Hog forage test in cooperation with Department of Animal Husbandry in the use of rye, rape and soybeans.
31. Legume garden of 28 species and varieties.

Grasses: 32. A comparison of 10 meadow grasses as regards yield, quality (including palatability) and permanency.

Oats: 33. Variety test of oats: Varieties grown in one-tenth acre plots, pure-line strains grown in one-hundredth acre plots; second-year pure-lines grown in eighteen-foot rows and duplicated; first-year pure-lines grown in head-row tests.
34. A comparison of secondary with primary grains in pure-line strains.

35. The relation of quality of seed, as graded by the fanning mill, to yield.

36. The relation of rate of seeding to yield

37. The relation of preparation of seed bed to yield.

Soybeans: 38. A test of varieties of soybeans grown for seed and for hay.

39. A plant-row test of selected individuals.

40. A comparison of soybeans with cowpeas.

41. A test of rate of seeding, ranging from one to eight pecks per acre.

42. A test of the value and method of inoculation for soybeans: three different commercial cultures compared with infected soil.

Wheat: 43. Variety tests of wheat: Varieties, many of which are pure-line selections, grown in tenth-acre plots; pure-line strains grown in one-hundredth acre plots; second-year pure-lines grown in eighteen-foot rows; first-year pure-lines grown in head-row tests

44. Special studies of variation in pure-lines of wheat with respect to:
   a. Size of kernel.
   b. Size of head, as indicated by length and by number of kernels per head.
   c. Tillering.
   d. Protein content.
   e. The relation of the above to yield.

45. A test of different grades of wheat as separated by the ordinary fanning mill.

46. The relation of rate of seeding, ranging from three to ten pecks, to yield.

47. The relation of early and late seeding to yield.

48. Milling and baking tests with different varieties.

Rotation and catch crops: 49. A test of 20 different crops and crop combinations used as catch crops at last cultivation or after corn harvest.

50. A test of grain vs. livestock rotation farming.

Plowing: 51. A comparison of very deep (15 ins.) with normal plowing (7½ ins.) and both with normal plowing plus subsoiling—rooting to the depth of 6 inches in the bottom of furrow.

Dynamite: 52. A test of the use of dynamite in preparing ground for alfalfa.

Sub-station and county farm work: 53. A test of deep and shallow plowing at Strongsville.
54. Variety tests of corn, wheat and oats, and work with alfalfa at Carpenter.
55. Variety tests of corn and wheat and alfalfa work at Germantown.
56. Variety tests of corn, oats and wheat at Findlay test farm.
57. Variety tests of corn, oats and soybeans, and a rate of seeding test of corn, at Paulding County Experiment Farm.
58. Variety tests of corn, oats and soybeans at Miami County Experiment Farm.
59. Variety tests of corn and soybeans, and a rate of seeding test of corn, at Hamilton County Experiment Farm.
60. Variety tests of corn, oats and wheat at Clermont County Experiment Farm.

ANIMAL HUSBANDRY

Beef cattle: 1. Rations for breeding cows.
2. Light, medium and heavy grain rations for young Angus cattle that are being fattened.
Sheep: 3. Comparison of large, medium and small ratios of protein in the ration.
4. Rations for winter lambs and their dams.
5. Rations containing varying amounts of linseed oilmeal to supplement corn, clover hay and silage. (The work with sheep is chiefly conducted at the Carpenter test farm).
7. The effect of age on rate and economy of grains in dry-lot feeding.
8. Experiments with bacon type hogs.
9. Hogging down green forage and grain crops. (The work with swine is in part conducted at the Miami county experiment farm).
11. Scant and full rations for laying hens.
12. Rations containing few and many varieties of feed for laying hens and young chickens.
14. Comparison of wide range with close confinement. (The poultry experiments are conducted at Wooster and Carpenter).
Animal parasites: 15. The following studies of animal parasites are being conducted:
a. Effect of change of pasture on the parasites of sheep.
b. The thorn-headed worm of swine.
c. The gape worm of poultry.
d. The ox warble fly.

BOTANY

1. Naming of weeds and other wild plants.
2. Examination of seeds for purity and germination.
3. Identification and means of control of orchard diseases.
4. Blight of apple and pear.
5. Diseases of clover and alfalfa.
7. Potato diseases.
8. Chestnut bark disease.
9. Breeding of cigar filler and possible binder types of tobacco.
10. Plant disease survey of the State conducted in cooperation with the Bureau of Plant Industry, U. S. Department of Agriculture.

CHEMISTRY

1. Availability of phosphorus supply of calcareous and non-calcareous soils of different types.
2. A chemical study of the wheat crop growing on differently treated soils, to determine—
   a. To what extent the phosphorus assimilated by the wheat plant is an indication of the available supply of phosphorus in the soil.
   b. The effect of supply or deficiency of phosphorus in relation to soil nitrogen supply on the proteid and carbohydrate content of the wheat grain.
3. Capacity of nitrogen fixing bacteria to convert insoluble phosphates into available organic phosphorus compounds.
4. Phosphorus absorption of soils.
5. Sulphur requirements of soils.
6. Changes produced by liming the soil.
   a. Rate of loss of lime under different treatments.
   b. Depth of soil affected.
   c. Relative efficiency of non-magnesian and magnesian lime materials.
7. Peat soils.
8. Effect of soil treatment on the quality of tobacco.
10. Miscellaneous chemical analyses for the other departments of the Station.
DAIRYING

1. Wide, medium and narrow rations for dairy cows.
2. Comparison of alfalfa and clover hay for milk production.
3. The cost of raising dairy heifers.
4. Effect on butterfat and composition of milk of various 
   feeds, systems of feeding, pasture, seasons, etc.
5. Effect of long inbreeding on form and size, vigor, production, etc.

ENTOMOLOGY

1. Studies of plant lice, especially those affecting orchards.
2. Relation of insects to transmission of fire blight.
4. Life history of Codling Moth.
5. Control of leaf-hoppers in grass lands.
7. Life history of clover leaf roller.
8. Studies of the more resistant scales and leaf eating 
   caterpillar.
9. Insect control on city shade trees.
11. Control of wooly aphis.
12. Control of oak maggot.
13. Control of insects affecting stored grain.
14. Control of the grape-berry worm.
15. Studies of the long horned wood boring beetles.
17. Studies of the stink-bug family.
19. Control of household insects.
20. Control of the peach tree borers.
21. Studies of the bark beetles.

FORESTRY

1. Propagation of forest trees in nurseries.
2. Management of farm woodlots.
3. Municipal forestry.
4. Forestry at public institutions.
5. Drainage basin studies.
6. Commercial tree studies.
7. Forestry in the public schools.

HORTICULTURE

Apples: 1. A test of over 400 varieties of apples, including all 
the well known ones and many new or little known varieties.
2. An orchard of seedling apples of merit discovered in various portions of the state.
3. Growing new seedlings from cross pollinated fruit.
4. Keeping yield records showing the production from year to year of each tree in the orchard.
5. A comparative study of different methods of orchard culture.
6. A study in intensive orcharding, using apple trees as fillers instead of berries and truck crops.
7. A study of the rapidity and manner of healing of wounds made in pruning.
8. A test of various wound dressings.
9. A test of the use of sawdust from various sources and of pomace as a mulch.
10. A study of the value of certain varieties as pollenizers for certain other varieties.
11. The behavior of different varieties in common and cold storage.
12. Different methods of hastening the fruit bearing period in young trees.

Currants: 15. A comparison of varieties, and of plants of the same variety from different nurserymen.
Gooseberries: 16. A comparison of varieties and of plants of the same variety from different nurserymen.
18. The behavior of different varieties in common and cold storage.
23. A 4-year rotation fertilizer test of ten plots with two crops of strawberries, and one each of potatoes and soybeans.
24. Growing strawberries under glass for winter fruit and for plant breeding.
26. Improvement of greenhouse tomatoes by crossing and selection.
27. Improvement of greenhouse cucumbers by selection.
29. Variety and strain test of greenhouse lettuce.
30. Improvement of the Cineraria by selection.
31. Trial of first generation crosses of tomatoes in greenhouse.
32. Test of commercial fertilizers on greenhouse soils.
33. Culture and improvement of head lettuce.
34. Special crops for hotbeds and cold frames.
   Vegetable gardens: 35. Variety and strain test of late cabbage.
   36. Breeding cabbage for disease resistance and improvement by crossing and selection.
37. Completing variety and strain test of early tomatoes.
38. Variety and strain test of canning tomatoes.
39. Improvement of strawberry by crossing and selection.
40. Breeding tomato for disease resistance.
41. Variety test of early garden peas.
42. Variety test of potatoes.
43. Variety test of onion on muck soil at Craigton.
44. Trial of newer varieties of onion under transplanting method.
45. Improvement of Chinese cabbage by selection.
46. Testing varieties of tomatoes on stakes.
47. Testing of methods of pruning tomatoes on stakes.
48. Variety and strain test of early celery.
49. Variety and strain test of late celery.
50. Comparison of cover crops and manure for truck crops.
51. Stimulation of germination and tuber formation of the potato.
52. Variety test of bush beans.
53. To determine yields from large and small one-year seedling asparagus plants.
54. Cover crops for truck gardens.

NUTRITION

*1. Review of the literature of phosphorus metabolism. (In publication.)
*2. Mineral metabolism and food digestion of swine. (Published as Bulletin 271.)
*3. Comparison of nutritive values of phosphates and glycero-phosphates by means of combined mineral metabolism and carcass analysis investigation.
*4. A feeding experiment on the specific effects of common foods on the growth of swine.

SOILS

1. Experiments in the use of fertilizers and manures are in progress as follows:
   On corn, oats and wheat, each grown continuously on the same land at Wooster since 1894.
   On corn, oats, wheat, clover and timothy, grown in 5-year rotations at Wooster since 1894 and at Strongsville since 1895.
   On potatoes, wheat and clover, grown in a 3-year rotation at Wooster since 1894.
   On corn, wheat and clover, grown in a 3-year rotation at Wooster since 1897.
   On corn, oats and clover, grown in a 3-year rotation at Wooster since 1905.
   On tobacco grown continuously on the same land at Germantown since 1903.
   On tobacco, wheat and clover, grown in a 3-year rotation at Germantown since 1903, and at the Miami county experiment farm since 1912.
   On corn, wheat and clover, grown in a 3-year rotation at Germantown since 1904.
   On corn, wheat and clover, grown in a 3-year rotation at Carpenter since 1904.
   On corn, oats, wheat and clover, grown in a 4-year rotation at Findlay since 1909.
   On corn, soybeans, wheat and clover, grown in a 4-year rotation at Findlay since 1909.
   On sugar beets, oats and clover, grown in a 3-year rotation at the Paulding county and Miami county experiment farms since 1912.
   On corn, oats, wheat and clover, grown in 4-year rotations at the Miami county experiment farm since 1911 and at the Paulding county experiment farm since 1912.
   On corn, soybeans, wheat and clover, grown in 4-year rotations at the Miami county experiment farm since 1911; at the Paulding county and Clermont county experiment farms since 1912, and at the Hamilton county experiment farm since 1913.
   On corn, corn, wheat and clover, grown as a 4-year rotation at the Miami county experiment farm since 1911.

2. Soil survey: The reconnaissance survey of the soils of the State has been completed and is in process of publication, and a
detailed survey by counties has been begun; this work being conducted in cooperation with the Bureau of Soils, U. S. Department of Agriculture.

3. Studies of the effect of different methods of fertilization upon the retention of moisture by the soil.

4. Investigations on the loss of plant food by drainage and erosion.

5. Special studies in the fertilization of soils are being conducted by means of pot cultures.

6. A study of the effect of fertilizers and lime on the physical condition of the soil.

7. Soil biology, including:
   a. Review of the literature.
   b. Refinement and improvement of the methods of recovery and determination of nitric nitrogen in soils.
   c. Physiological studies on the source of carbon for nitrification; nitrification in solution, in sand and in soil cultures, and effect of cropping and fertilization on the process.

Some of these investigations have been in progress for a number of years. Some have been reported upon from time to time, while others have not yet yielded sufficiently definite results to justify publication.

PUBLICATIONS

The following publications have been prepared during the year:


COUNTY EXPERIMENT FARMS

Late in the winter of 1913-14 official notice was received that Washington county had voted in favor of establishing a county experiment farm, and that bonds to the amount of $20,000 had been sold for this purpose. The Agricultural Commission visited the county in March, and after several visits and very careful study of the situation, directed the purchase of two tracts of land, one of 170 acres at Fleming, and one of nearly 10 acres in the Muskingum valley, about 4 miles north of Marietta.

The agricultural conditions in Washington county are materially different from those existing in any other county of the state. The county lies on the Ohio river, in the southeastern quarter of the state, and in topography is very hilly, as are all the counties bordering that river. The Muskingum river, flowing through the county from northwest to southeast, divides it into two nearly equal areas, and the flood plain of this river, as it approaches the Ohio, expands to a width of one to two miles, much of which is ordinarily above overflow.

In the early history of the county orcharding and sheep husbandry became prominent features of its agriculture; but with the increase of insect and fungous pests in the orchards they became less productive and fell into decay, while the sheep flocks, which had
been bred and maintained almost solely for their wool, went into decline when the artificial stimulus to wool production given by the tariff was withdrawn.

Meanwhile a large trucking industry had grown up in the Muskingum valley, the land there being naturally drained by underlying gravel, and sheltered from cold winds by the high hills surrounding it on all sides except the south, while the soil had become very fertile from the washings from those hills and the deposits from the occasional floods, usually coming as back water from the Ohio. Some idea of the importance to which trucking has attained in this region may be given by the statement that at the height of the season the past summer the daily shipments from it of tomatoes and other truck crops amounted to more than 30 carloads.

But the truck growers are not without their troubles. Blight and insect pests have sometimes caused serious losses, and evidence is increasing that some other means must be found for maintaining the fertility of the soil than natural agencies. For these reasons the truck growers had taken a very active interest in the establishment of the county experiment farm, and the Agricultural Commission felt that a recognition of the trucking industry was due, not only because of the local interest, but because of the fact that this industry is developing in many other sections of the state, due to the rapid increase in urban population, and that no adequate opportunity for the study of trucking problems has as yet been offered in the state.

But trucking, large as this industry has become in this county, constitutes after all but a small part of the total agricultural activities of the county. The experiment station has already demonstrated the possibility of reviving the orchards of the county, while the clothing of the more rugged portions with pasture grasses and useful forest growth are problems of vast importance. For these reasons the Agricultural Commission felt that the experiment farm for this county must be so located as to be able to take up some of the questions concerning the hill-land farmer, as well as the trucker.

It would have been very desirable to secure in one farm the necessary conditions for the study of all the varied agricultural activities of the county, but this was found to be impracticable, because the hills immediately bordering the valleys are so abrupt that no land could be found on those hills suitable for the plot studies which are an indispensable feature of the work of an experiment farm, and hence the selection of the two tracts, the one for trucking, the other for the study of general farming.
BUILDINGS AND EQUIPMENT

The addition to the main building, begun a year ago, is nearly completed. It contains nine office rooms, four basement rooms for printing and mailing, two lavatories and two large vaults, one designed for financial records and one for research records. The addition is of fireproof construction, but these vaults give greater security.

On the 12th of November the Station creamery was burned, causing much inconvenience in the dairy work. An appropriation has been made for a larger and more complete building for this part of the work, but better equipment for handling cattle is needed, including stables, storage room for feeds and land for soiling and pasture.

A shed for feeding cattle, 42 by 128 feet, has been completed and is now in use. A house, 16 by 80 feet in size, for housing small flocks of laying hens and for some individual feeding work, has been erected.

A 6-room dwelling has been erected at the Strongsville test farm, for the use of the foreman of that farm.

FURTHER EQUIPMENT NEEDED

About fifty of the laborers employed at the Station are compelled to walk from two to five miles daily in going to and returning from their work, because no houses can be found at any nearer point and there is no public transportation. This is a waste of energy that no business corporation would tolerate.

The chemical laboratory, always an indispensable part of the equipment of an agricultural experiment station, becomes more and more important each year. This Station operates five such laboratories, all located within a stone's throw of each other. The original laboratory is housed in a wing of the main building, which was adequate for its purpose 20 years ago, but which cannot by any practicable enlargement or rebuilding be made sufficient for the work demanded today, and consequently the others have been clustered around it in makeshifts of various description. As a plain, business proposition, these laboratories should be gathered under one roof, thus eliminating many duplications in equipment that are now unavoidable, and promoting efficiency of work.

The Station printery is now crowded into seven small rooms in the basement of the main building, under conditions which make efficient supervision impossible. Larger and better lighted rooms are urgently needed for this work.
Many of the supplies required by the Station are now purchased at retail because of the lack of store-room facilities. The rooms occupied by the printery should be used for storage of such supplies, for which purpose they were originally planned and are excellently adapted. The new requirements of the State Auditor’s office in respect to accounting for receipts and expenditures necessitate such a change in system as that above suggested, but room for storage must be provided before these requirements can be met.

PERSONNEL

APPOINTMENTS

The following appointments were made during the year:


CHANGES AND PROMOTIONS

E. R. Allen, Assistant in Soil Technology, was promoted to the rank of Associate; M. O. Bugby, W. M. Cook, F. N. Meeker, and A. L. Higgins, Assistants in the Department of Cooperation, were appointed County Agricultural Agents for Trumbull, Greene, Butler and Montgomery counties, respectively, and C. W. Montgomery, of the same department, was placed in general charge of county experiment farms. R. D. George and M. C. Meeker, herdsmen at the Boys Industrial School and Mansfield reformatory, have been transferred to the payrolls of those institutions.

RESIGNATIONS

Charles McIntire, Agent in charge of county experiment farms, resigned in order to accept the appointment of Chief Agriculturist of the Ohio Board of Administration. P. C. Herron Assistant in Agronomy, resigned, in order to accept the superintendence of the new penitentiary farm, near London. E. W. Gaither, Assistant Chemist, resigned in order to enter into business. W. L. Elser and H. W. Hawthorne, Assistants in Cooperation, accepted appointments respectively in the Extension Department of Purdue University, and in the Bureau of Plant Industry, U. S. Department of Agriculture. Miss M. Helen Keith, Assistant in Nutrition, resigned in order to pursue post-graduate studies. Joseph Brown
and Ural S. Elliott, resident managers of the Miami county and
Hamilton county experiment farms, resigned in order to enter
private business, and A. E. Smith, resident manager of the
Paulding county experiment farm, accepted the superintendence
of the farm of the College of Agriculture, Ohio State University.
Other resignations were, E. L. Nixon and J. H. Muncie, Assist-
ants in Botany; G. B. Maynadier and A. L. Higgins, Assistants
in Cooperation, and A. F. D. Wussow and C. W. Knudsen,
Assistants in Nutrition.

Respectfully submitted,

Charles E. Thorne,
Director.
REPORT OF THE BURSAR

HON. A. P. SANDLES, President, Agricultural Commission:

DEAR SIR: I respectfully submit herewith the financial report of the Station for the fiscal year ending June 30, 1914.

In statements A, B, C, and D, respectively, will be found a record of the receipts and expenditures from the various funds; statements A and B being statements of account with the appropriations received from the U. S. Government and a copy of the report made to the Governor of the State, the U. S. Secretary of Agriculture, and the Secretary of the U. S. Treasury; statement C being a statement of account with the State and Produce Fund.

The three statements, A, B, and C, are combined in statement D, which shows the total income and expenditures for the fiscal year.

STATEMENT A

Hatch Fund

THE OHIO AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE UNITED STATES APPROPRIATION UNDER THE HATCH ACT FOR 1913-1914

Dr.

To receipts from the Treasurer of the United States, as per appropriation for the year ending June 30, 1914, as per act of Congress approved March 2, 1887.............$ 15,000.00

Cr.

By expenditures for:

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<tr>
<td>Salaries</td>
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<td>Buildings and land</td>
<td>$347.43</td>
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Total...........................................$ 15,000.00
ANNUAL REPORT

STATEMENT B

Adams Fund

THE OHIO AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE
UNITED STATES APPROPRIATION UNDER THE ADAMS ACT
FOR 1913-1914

Dr.

To receipts from the Treasurer of the United States,
as per appropriation for the fiscal year ending June 30,
1914, as per act of Congress approved March 16, 1906...............$ 15,000.00

Cr.

By expenditures for:

Salaries ......................................... $ 12,769.02
Labor .............................................. 163.92
Postage and stationery......................... 3.60
Chemicals and laboratory supplies............... 260.77
Seeds, plants, and sundry supplies........... 4.50
Library........................................... 48.21
Tools, machinery and appliances............... 153.00
Scientific apparatus and specimens........... 1,596.98

Total............................................$ 15,000.00

I, the undersigned, duly appointed Auditor of the Corporation, do hereby
certify that I have examined the books and accounts of the Ohio Agricultural
Experiment Station for the fiscal year ended June 30, 1914; that I have found the
same well kept and classified as above; that the receipts for the year from the
Treasurer of the United States were $15,000.00 under the act of Congress of
March 2, 1887, and $15,000.00 under the act of Congress of March 16, 1906, and
the corresponding disbursements $15,000.00 and $15,000.00; for all of which
proper vouchers are on file and have been by me examined and found correct.

And I further certify that the expenditures have been solely for the purposes
set forth in the acts of Congress approved March 2, 1887, and March 16, 1906,
and in accordance with the terms of said acts, respectively.

Signed,

C. G. WILLIAMS.
STATEMENT C

THE OHIO AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATE AND PRODUCE FUND

Dr.

To Receipts

From State Appropriations ................................. $201,625.00
  " Department of Administration ....................... 1,176.60
  " " Agronomy ............................................. 2,429.44
  " " Animal Husbandry .................................. 10,207.93
  " " Botany ............................................... 65.00
  " " Chemistry .......................................... 266.13
  " " Cooperation ......................................... 3,834.51
  " " Dairy Husbandry .................................... 3,490.73
  " " Entomology .......................................... 132.00
  " " Forestry ............................................. 850.01
  " " Horticulture ........................................ 4,621.60
  " " Nutrition ........................................... 1,779.48
  " " Soils ................................................. 1,918.08

Total .................................................... $232,399.51

To balance brought forward July 1, 1913 ................. 219,019.31

Total .................................................... $451,418.82

Cr.

By Expenditures

For Salaries ............................................... $ 87,113.29
  " Labor ................................................. 43,776.13
  " Publications .......................................... 10,085.99
  " Postage and stationery ................................ 2,297.18
  " Freight and express .................................. 2,923.67
  " Heat, light, water and power ........................ 5,873.42
  " Chemical and laboratory supplies .................... 1,434.45
  " Seeds, plants and sundry supplies .................... 11,897.24
  " Fertilizers ........................................... 8,542.11
  " Feeding stuffs ........................................ 11,809.06
  " Library ................................................. 1,386.75
  " Tools, machinery and appliances ..................... 14,492.24
  " Furniture and fixtures ................................ 37.49
  " Scientific apparatus and specimens ................. 1,152.59
  " Live stock ............................................. 4,894.64
  " Traveling expenses .................................... 17,319.50
  " Contingent expenses ................................... 2,059.87
  " Building and land ..................................... 45,269.59

Total .................................................... $265,805.21

By balance forward ....................................... 185,613.61

Total .................................................... $451,418.82
STATEMENT D

TOTAL RECEIPTS AND EXPENDITURES OF THE OHIO AGRICULTURAL EXPERIMENT STATION FOR THE YEAR ENDING JUNE 30, 1914

Dr.

Total Receipts

From U. S. Government ........................................ $30,000.00
“ State appropriations .......................................... 201,625.00
“ Produce Fund .................................................. 30,774.51

Total ................................................................. $262,399.51
To balance brought forward July 1, 1913 ..................... 219,019.31

Total ................................................................. $481,418.82

Cr.

Total Expenditures

For Salaries ...................................................... $112,229.79
“ Labor ............................................................ 45,494.49
“ Publication ..................................................... 10,085.99
“ Postage and stationery ....................................... 2,300.78
“ Freight and express ........................................... 2,923.67
“ Heat, light, water and power ................................ 5,873.42
“ Chemical and laboratory supplies ......................... 1,803.39
“ Seeds, plants and sundry supplies ......................... 11,633.11
“ Fertilizers ...................................................... 2,542.11
“ Feeding stuffs ............................................... 11,809.06
“ Library ......................................................... 1,450.51
“ Tools, implements and machinery ......................... 14,645.24
“ Furniture and fixtures ..................................... 104.34
“ Scientific apparatus and specimens ....................... 3,088.28
“ Live stock ...................................................... 4,804.64
“ Traveling expenses .......................................... 17,319.50
“ Contingent expenses ....................................... 2,059.87
“ Buildings and lands ......................................... 45,617.02

Total expenditures for the year ......................... $295,805.21
By balance forward ........................................... 185,613.61

Total ................................................................. $481,418.82

Respectfully submitted,

W. H. KRAMEK, Bursar.
APPENDIX

Publications

OF THE

Ohio Agricultural Experiment Station

1913-1914

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No. 353. CATTLEMEN ARE CONCERNED. OX WARBLE FLY CAUSE OF TROUBLE. GRUBS SHOULD BE DESTROYED.

Cattle grubs, where infestation is heavy, seriously interfere with gains in fattening cattle and reduce the flow of milk in dairy cattle. Cases demonstrating this fact are numerous each spring during the “grubby” season. On a Wayne county farm 91 grubs were extracted from the back of a 15-months-old Hereford heifer. The heifer should have weighed 600 to 750 pounds at this age with average care and feed,—instead it was weak and emaciated and weighed only about 325 pounds. Reports received by the Ohio Agricultural Experiment Station indicate that cattle are affected in various other parts of the state. A case is recorded by Boas, in Denmark, of an infested dairy cow which remained in poor condition and gave 33 pounds of milk per day. Forty-six grubs were extracted from the back of this animal, and 8 days later she was giving 44 pounds of milk per day. In this case the loss of milk, due to grub infestation, was twenty-five percent. The hides of grub-infested cattle are so damaged that they are discriminated against when marketed. A grubby hide in the green state is generally valued at one cent per pound less than a perfect hide.

The fly (Hypoderma lineata) that causes this grub is known as the ox warble fly, the heel fly, or the ox bot fly. The eggs are deposited upon the hairs during the spring and summer, and the animal on licking them carries the eggs or larvae into its mouth. The young maggot passes into the gullet. From the gullet it migrates to the back, where it causes a lump or swelling noticed in late Winter or early spring. In the spring or early summer months, the grub emerges from the back of the animal through a small hole previously used for breathing purposes. Falling to the ground and burrowing in it the grub enters the pupal state, which covers a period of from three to six weeks. At the end of that period a two-winged fly emerges. Thus the complete life history covers almost a year.

The large black gad fly, a blood-thirsty Tabanid closely related to the common greenhead horseflies, is not, as is often supposed, the parent of the cattle grub. The two are not in any way connected.

The most effective means of combating the cattle grubs is to squeeze them out and destroy them. This method has been tested by several cooperative dairymen’s associations in Denmark and resulted in a substantial reduction of the number of grubs. The French Association for Grub Eradication recommends the removal of the grubs by means of pressure with the thumb and fingers when the warble is “ripe.” When the warble is smaller and firmer to the touch, the grub may be extracted by inserting a pair of small forceps into the opening of the tumor. If the opening is too small to permit the removal of the grub with the forceps, it may be enlarged by a small incision with a sharp knife. Strong pressure will then force the grub out through this artificial

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opening. Care should be exercised to destroy all grubs that are removed, otherwise they may pass into the pupal stage and ultimately develop into adult flies. After the removal of the grubs an antiseptic should be applied to the effected portions of the hide.

No. 354. May 1, 1914. DIP TICK INFESTED SHEEP.

Reports received by the Ohio Experiment Station indicate that the sheep tick is still doing much damage in some flocks throughout the State. The sheep tick if allowed to feed and multiply unchecked upon sheep and lambs, will cause incalculable damage. The continuous biting and scratching of tick infested sheep causes the fleece to have a ragged appearance. The irritation which the ticks produce, the blood which they draw, and the poison which they inject under the skin of the sheep all tend to prevent a profitable utilization of the feed whether the sheep are used for breeding or for feeding purposes.

These losses may be prevented. The careful and faithful dipping of the exposed or infested animals in a properly prepared dip would in a short time completely eradicate the tick from the flocks of the state.

Carbolic acid or coal tar dips are effective in destroying the sheep tick and when skillfully prepared leave the wool and skin in good condition. They may be purchased on the market as proprietary dips or made at home. A home made dip, recommended by the English Board of Agriculture and Fisheries, is prepared as follows: "Dissolve 5 pounds of good soft soap with gentle warming in 3 quarts of crude liquid carbolic acid (containing not less than 97 percent of real tar acid). Mix the liquid with enough water to make 100 gallons. Churn vigorously." One great advantage with this class of dips lies in the fact that they are easily prepared. A disadvantage is that with some of the proprietary dips, the shepherdsman is uncertain regarding the strength of the material he is using. He should insist on getting a dip of guaranteed strength with explicit directions for its use. Care must be taken that the ingredients form a thorough emulsion; if a scum rises to the top, a softer water should be used.

Another class of dips effective against the ticks is the tobacco dips. These also may be made at home, or purchased on the market as prepared nicotine or tobacco dips. As with the carbolic dips, one should insist on getting a prepared tobacco dip of a guaranteed strength, with specific directions for its preparation. A home made tobacco dip is prepared as follows: "For every 100 gallons of dip desired, take 21 pounds of tobacco leaves; soak the leaves in cold or lukewarm water for 24 hours in a covered pot or kettle; then bring the water to near the boiling point for a moment and allow the infusion to draw for an hour or so; the liquid is next strained (pressure being used to extract as much nicotine as possible from the wet leaves) and diluted to 100 gallons. This dip should be used as fresh as possible, as it contains a large amount of organic material which will soon decompose." The tobacco dip has the advantage of being relatively cheap, effectual and not injurious to the wool. It has the disadvantage of sometimes sickening the sheep and persons working with them, and of spoiling very rapidly.

Dipping. The sheep should be dipped twice about three weeks apart; the second time in order to destroy any young ticks that may have hatched since the first dipping. It is advisable to dip sheep while the wool is short, as the work is then done with less liquid as well as more effectually. The ram and pregnant ewes should be carefully handled, as they are more susceptible to injury than are the other sheep. The dip should be kept clean during the process of dipping, both by skimming floating particles off the surface, and by changing the fluid at intervals.
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