COUNTY EXPERIMENT FARMS IN OHIO

OHIO
Agricultural Experiment Station

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BULLETIN 241

OHIO AGRICULTURAL EXPERIMENT STATION

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BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 241 JUNE, 1912.

COUNTY EXPERIMENT FARMS IN OHIO

THEIR ORGANIZATION AND WORK IN 1911

By C. E. THORNE, C. G. WILLIAMS and CHARLES McINTIRE

During the winter of 1909-10, while a subcommittee of the Finance Committee of the House of Representatives of the Ohio legislature, consisting of George M. Wilber of Marion County, Howard W. Pears of Allen County and Joseph Justice of Putnam County, were visiting the Ohio Experiment Station for the purpose of inquiring into its financial needs, the remark was made by one of them and concurred in by the others that there "ought to be an experiment farm in every county," a remark that bore fruit in the introduction by Mr. Wilber of a bill which passed, practically without opposition, in the following form:

Be it enacted by the General Assembly of the State of Ohio:

SECTION 1. That section 1165 of the General Code be supplemented by the enactment of sections 1165-1, 1165-2, 1165-3, 1165-4, 1165-5, 1165-6, 1165-7, 1165-8, 1165-9, 1165-10, 1165-11, 1165-12 and 1165-13 to read as follows:

Sec. 1165-1. In order to demonstrate the practical application under local conditions of the results of the investigations of the Ohio Agricultural Experiment Station, and for the purpose of increasing the effectiveness of the agriculture of the various counties of the state, the commissioners of any county in the state are hereby authorized and empowered to establish an experiment farm within such county as hereinafter provided for.

Sec. 1165-2. The experiment farms established under this act shall be used for the comparison of varieties and methods of culture of field crops, fruits and garden vegetables; for the exemplification of methods for controlling insect pests, weeds and plant diseases; for experiments in the feeding of domestic animals and in the control of animal diseases; for illustrations of the culture of forest trees and the management of farm woodlots; and for the demonstration of the effects of drainage, crop rotation, manures and fertilizers, or for such part of the above lines of work as it may be practicable to carry on.

Sec. 1165-3. Upon the filing of a petition with the county auditor signed by not less than five percent of the electors, based upon the vote for governor at the last preceding election, residing within the county, the commissioners of such county shall submit to the qualified voters of such county a proposition to establish an experiment farm within such county, and to issue notes or bonds for the purchase and equipment of such farm, such proposition to be voted upon at the next general election following the receipt of the petition by the commissioners. Notice of the intention to submit such proposition shall be published by the county commissioners in two newspapers of opposite politics printed and of general circulation in said county, for at least four weeks prior to the election at which the proposition is to be voted upon, together with a statement of the maximum amount of money which it is proposed to expend in the purchase and equipment of such farm.

Sec. 1165-4. The county auditor shall file a written request with the board of deputy supervisors of elections asking for the preparation of the necessary ballots, which ballots shall be separate and apart from all other ballots, and which ballots shall have printed thereon "Tax for experiment farm—yes"; "Tax for experiment farm—No." The result of such election shall be ascertained by the board of deputy supervisors of elections and the result thereof certified to the county auditor.

Sec. 1165-5. If a majority of the electors voting on such proposition in the county are in favor of establishing such experiment farm, then the commissioners of the county shall levy a tax on all the taxable property in such county as listed for taxation on the county duplicate, which levy shall not exceed one-fifth of one mill on the dollar of the taxable property of the county in any one year, nor shall the aggregate of all levies for such purpose exceed two mills on the dollar.

Sec. 1165-6. To anticipate the collection of the tax authorized by this act and the use of the money to be raised thereby, the commissioners are hereby authorized and required to issue the notes or bonds of their county, such notes or bonds to bear interest at a rate not to exceed six percent per annum, and not to run to exceed ten years, and not to be sold for less than their par value, and the proceeds of the sale thereof shall be deposited in the county treasury, to be applied by the commissioners to the purchase and equipment of an experiment farm, containing eighty acres or more, as hereinafter provided for.

Sec. 1165-7. When the funds provided for in this act are deposited in the county treasury, the commissioners shall notify the board of control of the Ohio Agricultural Experiment Station of their action, on receipt of which notice it shall be the duty of said board of control to visit the county and assist in the selection of a farm to be used for the purpose specified in this act, provided that no farm shall be purchased except with the approval of a majority of the members of said board of control and also of a majority of the board of county commissioners of the county.

Sec. 1165-8. The equipment of an experiment farm shall consist of such buildings, drains, fences, implements, live stock, stock feed and teams as shall be deemed necessary by the board of control of the experiment station for the sucessful work of such farm, and the initial equipment shall be provided by the county in which the farm is established, together with a sufficient fund to pay the wages of the laborers required to conduct the work of such farm during the first season. The county commissioners shall appropriate for the payment of the wages of laborers employed in the management of such farms as may be established under this act, and for the purchase of supplies and materials

necessary to the proper conduct of such farms such sums not exceeding two thousand dollars annually for any farm, as may be agreed upon between said commissioners and the board of control of the experiment station.

Sec. 1165-9. The management of all experiment farms established under authority of this act shall be vested in the director of the Ohio Agricultural Experiment Station, who shall appoint all employees and plan and execute the work to be carried on, in such manner as in his judgment will most effectively serve the agricultural interests of the county in which such farm may be located, the director and all employees being governed by the general rules and regulations of the board of control of said Experiment Station.

Sec. 1156-10. Before entering upon any line of investigation or demonstration upon any of the experiment farms established under this act, the director of the experiment station shall submit a written plan of such contemplated work to an advisory board, consisting of the county agricultural society of the county in which such experiment farm may be located, or if there be no county agricultural society, then of the board of county commissioners of such county, and if such plan is not approved by such advisory board, then the work shall not be undertaken.

Sec. 1165-11. The county commissioners of any county may assign to the board of control of the Experiment Station such portion of any farm now owned by the county as may be mutually agreed upon between the commissioners and the board of control, the land thus assigned to be occupied and used by the experiment station for the purpose specified in this act and under the management of the director of the station.

Sec. 1165-12. The produce of each of such experiment farms as may be established under this act, over and above that required for the support of the teams and live stock kept on the farm, shall be sold and the proceeds applied to the payment of the labor and to the purchase of the supplies and materials required for the proper management of the farm as contemplated by this act, and for the maintenance of its equipment. All surplus beyond these requirements shall be covered into the county treasury and placed to the credit of the general fund of the county, except in the case of the use of farms already belonging to the county, in which case the proceeds shall be placed to the credit of such fund as the county commissioners may designate.

Sec. 1165-13. In case the experiment station shall cease to use for the purposes herein specified any farm established under this act, such farm and its equipment shall be sold at public auction to the highest bidder after notice of such proposed sale shall have been published for four consecutive weeks in two newspapers of opposite politics, once a week, published in and having the largest circulation in the county within which the farm is located, and the proceeds of such sale shall be covered into the county treasury, the sums thus covered to be placed to the credit of the school funds of the county.

GRANVILLE W. MOODY,
Speaker of the House of Representative.
FRANCIS W. TREADWAY,
President of Senate.

Passed April 13, 1910.
Approved April 23, 1910.
JUDSON HARMON, Governor.

The reason for the enactment of such a law is that the work of the Experiment Station has demonstrated the possibility of very greatly increasing the income of the farm, and of doing this by methods which leave a liberal margin of profit. For example, on the main farm in Wayne county the yield of wheat has been increased from less than 12 bushels per acre to 34 bushels, and that of corn from 30 to more than 70 bushels, at a cost which has been repaid several times over in the increase of crop. Similar results are being attained in the Station's orchards, and on its test farms in Cuyahoga, Montgomery and Meigs counties, although the work on these test farms is bringing out the fact, that soils of different geological origin, or which have been subjected to different systems of management, require different methods of treatment in order to produce the most economical results.

The outcome of the Station's work is published in its bulletins, but the printed page can never be so satisfactory a demonstration as the crop actually growing in the field; and it is manifestly impossible for any large number of farmers to see the crops in the Station's fields and orchards. The county experiment farms, therefore, will serve the purpose of extending the Experiment Station to every county in the state which may establish such a farm, and thus of bringing its work within reach of every farmer in those counties.

Plan of management: The law places the management of the county experiment farms in the State Experiment Station. This Station has been established by the State at a cost of a quarter of a million dollars, and the State and National governments are jointly expending nearly that sum annually in its support. The Station staff consists of men who have become experts in the various departments of science most closely related to agriculture, and who are provided with the most effective equipment for scientific research, in the way of laboratories and apparatus, that the world can furnish. It is manifestly impossible to maintain such a station in every county on an independent footing; but under the law the county experiment farms will become integral parts of the main station, and through them its great resources will be directed towards the solution of the local problems of each county in the state.

To successfully carry out such a scheme as this it is evident that the county farms must be under the absolute control of the main station, and such control is provided for in the law, although it also provides for consultation with persons representing the agriculture of the county, and in fact, gives such persons the power to determine the general policy of the county farm.

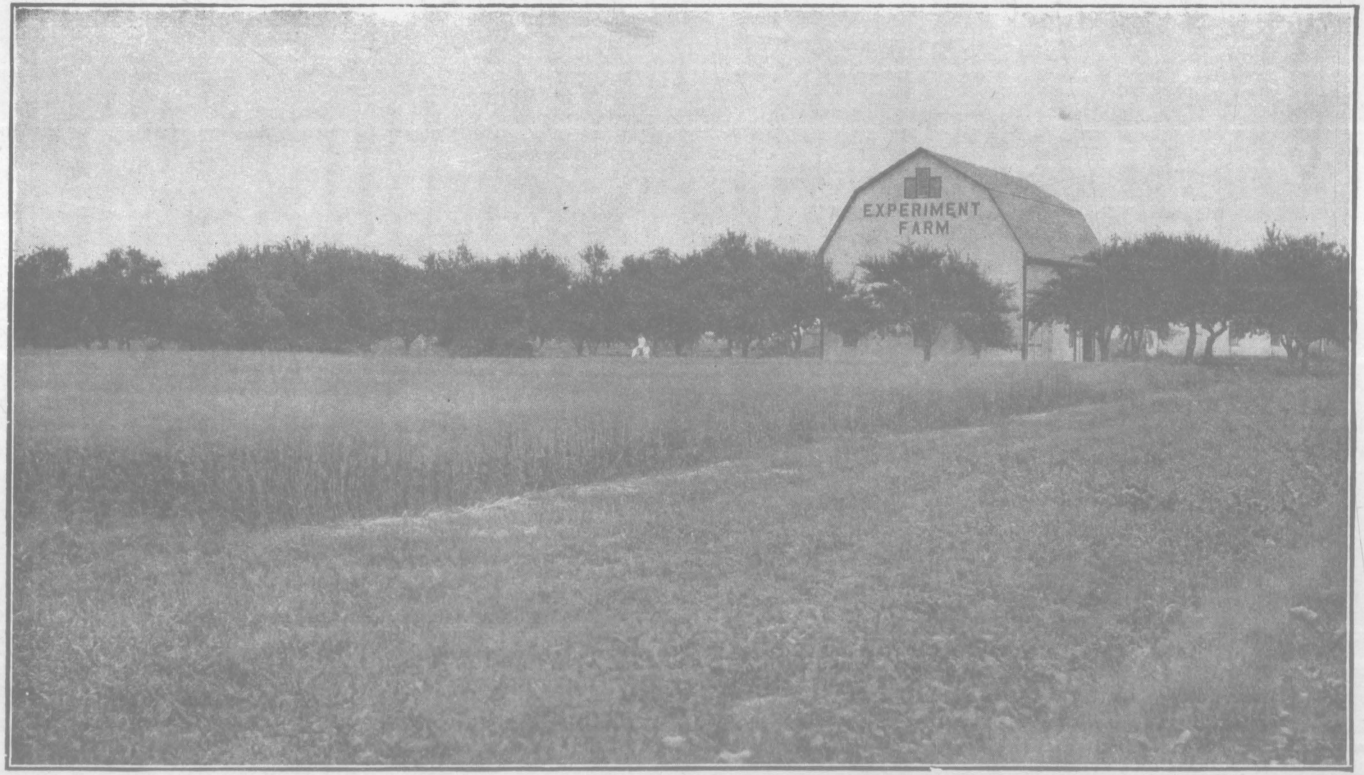
Under authority of this law the counties of Paulding, Miami, Clermont and Belmont voted in favor of establishing county experiment farms at the November election of 1910, and Hamilton county at that of 1911, and on invitation of the respective boards of County Commissioners, the Board of Control of the Experiment Station visited Paulding, Miami and Belmont counties in March and April, and Clermont county in August, 1911, and Hamilton county in February and March, 1912, and authorized the purchase of a farm in each county. The purchase of a farm for Belmont county has been prevented by difficulty in finding a suitable farm from which the underlying coal has not been sold or reserved, the Attorney Genral having advised against the purchase of a farm under such conditions, on the ground that the privilege of entering upon the land to remove the coal might interfere with the use of the farm for experimental purposes. In the other counties work has been commenced as follows, the work being conducted under the immediate supervision of Charles McIntire, Agent in Charge.

PAULDING COUNTY

The Paulding County experiment farm contains 92 acres, and lies a mile and a half south of Paulding and between the Cincinnati Northern Railway and the turnpike east of the railway connecting Paulding and Latty. The land is the flat, black land characteristic of the western part of Paulding county, and which has been named Clyde Clay by the Bureau of Soils of the U. S. Department of Agriculture. There is a slight elevation near the middle of the farm, on which an orchard is located, the trees having been planted about 20 years ago. The land had been partially drained with a large open ditch running across the west half of the tract and another along the turnpike, into which tile drains, spaced 4 to 8 rods apart, had been carried. It will be necessary to at least double the amount of tile drainage. The farm dwelling had been burnt several years ago, and the barn was simply a hovel, so that it was necessary to build both house and barn at the start. A one story, 4-room house, and a barn 36 by 70 feet in size have been erected.

The farm contains two tracts, one of 80 acres, lying north of an east-and-west road crossing the turnpike and railway, and one of 12 acres, south of this road.

The following general plan of management was submitted to the Paulding County Agricultural Society and approved April 25, 1911:



A scene on the Paulding County Experiment Farm.

THE PAULDING COUNTY EXPERIMENT FARM

PROPOSED PLAN OF MANAGEMENT

The maintenance of the fertility of the soil is the foundation of successful agriculture, and it is not less important to maintain the fertility of a good soil than to restore the productiveness of one that has been exhausted by improvident husbandry. It would seem, therefore, that experiments designed to work out the most practical methods for maintaining and increasing the productiveness of the land should occupy the leading place in the county experiment farms, and that these experiments should be so planned as to articulate with common farm practice in the county and also with the similar experiments in progress at the State Experiment Station and its several distrtct test farms. The agricultural statistics of Paulding County, as collected by the township assessors, show that the following areas were occupied as indicated during the average of the 10-year period, 1900 to 1909 inclusive:

Corn	46,710	acres
Oats and Barley	35,854	"
Wheat and Rye	14,956	"
Meadows	17,454	"
Clover	7,352	"
Pasture	22,404	"
Woodland	20,765	"
Waste	2,967	"

About 2,300 acres additional were occupied with orchards and minor crops, making a total area reported at about 170,000 acres.

These statistics show that corn is the principal crop of the county, and indicate that crop rotation is not systematically practiced, the area in corn being nearly as great as that in the small grains combined, while that reported as clover averages less than one-thirteenth of the entire area in cereal crops.

The fact that the soil of Paulding county has proven to be so well adapted to the production of corn has been the main factor in bringing the lands of this county up to the high values at which they are now held; but if these values are to be maintained the productiveness of the soil must not be diminished, and experience has shown that no crop, and especially corn, can be continuously grown on the same land without eventual deterioration in yield. It should be a leading aim of the county experiment farm, therefore, to work out a system of cropping which will lead to the greatest aggregate production of corn over a long period of time without reducing the capacity of the land for further production of this crop.

The culture of the sugar beet has become a very important item in the agriculture of Paulding county, and experiments should be instituted with this comparatively new crop, having for their object the improvement of varieties and methods of culture and a study of the effect of fertilizers, manures and rotation upon the yield of sugar.

While the production of fruit will probably always occupy a less important position in the agriculture of Paulding county than in some other sections of the state, yet there is good reason to believe that even in this county the farm orchard may be made to yield a return which will compare favorably with the best yields of the corn and sugar beet crops, and enough should be done to ascertain definitely whether this belief is well founded. At any rate, it is as important to demonstrate the impracticable as the practical, where there is room for any doubt upon the subject, in order to prevent a waste of energy upon unprofitable lines of work.

For the foregoing reasons the following lines of work are proposed for the Paulding County Experiment Farm:

1. A study of the corn crop, including comparisons of varieties and methods of culture, different rotations, and the use of fertilizers and manure. Incidentally, this work will also include oats and wheat, as they will be used in the rotations.

2. A similar study of the sugar beet crop. In both these lines the work will be commenced on tenth-acre plots, from which it will be carried to demonstration fields, following the system at the main Station, where the methods indicated by the plot tests are being carried out on 10-acre fields.

3. Experiments in orcharding, designed to determine the best varieties and methods of management for Paulding county conditions.

4. Experiments in feeding, having as their chief objects the utilization of the corn and crop residues—corn stover, straw, beet tops and pulp—in the production of meat, as against selling the grain and returning the residues to the soil.

In the execution of this plan it is proposed to devote the west end of the farm to the sugar beet, growing it in a 4-year rotation of beets, oats, wheat and clover, and possibly also of beets, corn, oats and clover. The east end of the farm will be used for work with corn as the leading crop, and three rotations are proposed, viz.: (1) corn, oats, wheat clover; (2) corn, soybeans, wheat, clover, and (3) corn, corn, oats, clover. At a later date it may be possible to take up a 3-year rotation of corn, oats, clover, or corn, wheat, clover on the 12 acres south of the east-and-west road.

Plans for the orchard and feeding experiments will submitted later.

This farm was purchased subject to a year's lease, but arrangements were made with the lessee, under which he surrendered his claim and entered the service of the Station, and the work of rearranging the farm for its new purpose was begun at once, by laying out two series of plots, one on the east end of the farm for experiments with cereal crops, and one on the west end for the sugar beet work.

FERTILITY TESTS

Fertility tests were started in both these experiments, but the continuous rains in the fall made it impossible to harvest the sugar beets in such manner as to get any reliable results, and in the cereal rotations the corn was so injured by wire worms as to make the results unreliable. Part of the land selected for the cereal work, moreover, has proved to be unsuited to the purpose, and it will be necessary to begin this work again on another tract of land.

VARIETY CORN TEST

In the Paulding County corn tests, 18 varieties, most of which were picked up locally, were compared, together with rough and smooth types of 5 other varieties.

The yield per acre of grain and stover is given in Table 1. The yield of grain is recorded as corrected by the check plots, every third plot being planted to the same variety for this purpose, the Darke County Mammoth being used as check.

TABLE I: A Comparison of varieties of corn in Paulding County, 1911

Variety	Yield per acre		Lbs. of stover per bu. of grain
	Grain Bus.	Stover Lbs.	
Clarage, Wayne County	37.59	3,755	100
Ohio No. 84	39.30	3,510	89
Leaming	46 14	3,290	71
Cook's No. 75	46.09	3,510	76
Stewart's Clarage	44.50	3,770	85
Wheeler's Clarage	48.23	3,490	72
Wheeler's Reid	36 37	4,205	116
Patton's Dent	38.42	3,865	101
Wheeler's Pedigreed 75	38 56	4,000	104
Poling's Dent	41 81	3,415	82
Wander's Dent	41.33	3,645	88
Miliki	43 42	2,970	68
Fish's Dent	41.54	3,320	80
Going's Clarage	37.47	2,745	73
Morisy's Yellow Dent	43 18	3,320	77
Morisy's Gold Mine	43.97	3,650	83
Going's Pedigreed Dent	32.97	3,040	92
Reim's Rough Dent	30 32	4,390	145
Darke County Mammoth—Rough	48 61	3,890	80
Darke County Mammoth—Smooth	49.33	4,500	90
Cook's No. 75—Rough	46 99	4,460	95
Cook's No. 75—Smooth	46 37	5,040	108
Dobbin's Reid—Rough	41 22	3,060	74
Dobbin's Reid—Smooth	42 01	3,130	75
Leaming—Rough	41.13	3,190	78
Leaming—Smooth	40 66	3,400	84
Orcutt's Reid—Rough	45.90	4,420	96
Orcutt's Reid Smooth	42 18	3,890	92
Average of all checks	45.61	3,670	80

Of the above varieties the Darke County Mammoth—smooth type—stands first in yield, the rough type of the same variety second, Wheeler's Clarage third, and Cook's 75—rough—fourth.

For further information upon the comparative yield of rough and smooth types see reports for Hancock and Miami counties.

MIAMI COUNTY

The farm selected in this county is a tract of 123 acres, lying on the north side of the Troy and Covington turnpike, about two miles northwest of the courthouse in Troy. The land has the level topography of that region, the differences in altitude between the highest and lowest points on the farm probably not exceeding 5 feet. The soil is the decomposed glacial drift formed by the movement of the glaciers over the limestone floor of western Ohio, the higher portions being the yellow clay classified by the U. S Bureau of of Soils as "Miami Clay Loam," the depressions being the same clay darkened by deposit of organic matter and called "Miami Black Clay Loam." The original timber on the higher land was chiefly white oak, and that of the lower portions elm.

The farm buildings consisted of two small dwellings and a small barn and cornhouse. The north and south ends and west side of the tract were fenced, but the division fences on the farm were

worthless. This, however, was a matter of no importance as the rearranging of the fields will require the changing of all inside fences. A county tile drain runs through the farm, but with this exception there was practically no drainage. The following general plan of management for this farm has been submitted to the County Agricultural Society and approved by them:

THE MIAMI COUNTY EXPERIMENT FARM

PROPOSED PLAN OF MANAGEMENT

In Miami county, as throughout the southwestern quarter of Ohio, corn occupies a larger area than is given to the small grains combined, the areas in the cereal crops and in meadows and clover for 1909, being as follows:

Corn	60,912 acres
Oats	33,959 "
Wheat	25,376 "
Meadows	16,792 "
Clover	8,539 "

It appears that a 5-year rotation of corn, corn, oats, wheat, clover would approximate the average practice of the county.

The average yields of corn and wheat for the past 60 years are given below by 10-year periods:

Miami County: Average yield in bushels per acre

	1850-59	1860-69	1870-79	1808-89	1890-99	1900-99
Corn	33.1	34.3	38.8	40.4	37.4	43.7
Wheat	15.3	14.2	15 1	16.3	16.6	15.6

These yields have been higher than the average for the state during the same periods, but they indicate practically stationary conditions during the last 40 years.

The maintenance of the fertility of the soil is the foundation of successful agriculture, and it is not less important to maintain the fertility of a good soil than to restore the productiveness of run down land. It would seem, therefore, that experiments designed to work out the most practical methods for maintaining and increasing the productiveness of the land should occupy a leading place in the work of the county experiment farms, and that these experiments should be so planned as to articulate with common farm practide in the county and also with the similar experiments in progress at the State Experiment Station and its several district test farms.

To this end we would propose a principal experiment in the use of fertilizing materials in different combinations, and of manures variously treated, on corn, oats, wheat and clover, grown in a 4-year rotation, accompanied by parallel tests in which other rotations would be compared.

In tests of this character every crop should be grown each season, and for a comparison of fertilizing materials and manures there should be about 20 plots, of one-tenth acre each, for each crop. These plots, with their necessary headlands and dividing spaces would occupy about 10 acres of land.

The official statistics show that in 1909 Miami county had less live stock in proportion to area in crops than any adjoining county, and observation of the farm practice of the county justifies the inference that the grain is largely sold off the farm, and that much of the corn stover is left unharvested.

The general assumption that the keeping of live stock is essential to the most economical maintenance of soil fertility is questioned by good authority, and it would seem appropriate to put this matter to test in Miami county, and hence a test is proposed in which on the one hand the grain will all be sold off the farm, the crop residue—stalks, straw, &c.—being returned to the land, and fertilizing elements will be added in quantity sufficient to replace those carried away in the grain, and on the other hand, the crsps will be harvested and utilized for feeding and bedding live stock. This experiment also will require 10 acres of land or more.

The high cost of labor and the difficulty of getting reliable help at any price is a matter of increasing importance on Ohio farms, and a third line of experiment is proposed in which the object will be to economize labor by harvesting the crop largely by hogs, thus reducing the cost of meat production. In the execution of this experiment corn will be grown as the major crop, to be supplemented by forage crops and clover to give a succession of feed throughout the season. This experiment will probably require about 30 acres.

The comparison of varieties of the cereals, corn, oats and wheat, should occupy a prominent place on the county experiment farm, as this work will produce results more quickly than the other lines indicated, and will add much to the interest of those visiting the farm. About 10 acres, plotted in tenth-acres and thoroughly drained, should be alloted to this work.

While orcharding is not likely ever to assume such importance in Miami county as in the more hilly counties of the state, yet a few acres should be devoted to this work, having special reference to the local conditions.

It was in April before the details relating to the purchase of this farm were settled and the farm turned over to the management of the Experiment Station. Before its purchase by the county the farm had been rented for one year to Mr. Joseph Brown. An agreement was entered into with Mr. Brown under which he transferred his rights under his lease to the Experiment Station and entered into the service of the Station as Superintendent of the farm. He had already done some plowing, but the changes in plan required to adapt the farm to its new purpose involved much additional labor, which was further impeded by excessive rains, and although Mr. Brown pushed the work forward with great energy and effectiveness, it was quite late before all the crops could be planted.

A beginning was made in the draining of the farm by the laying of about 440 rods of tile drain. A new road had been authorized along the east side of the farm before its purchase. This road was opened during the summer. A new barn was built in the fall, designed to provide facilities for taking care of the experimental crops. It is 36 by 70 feet on the ground, with concrete floor over the whole, and 18 feet high at the eaves.

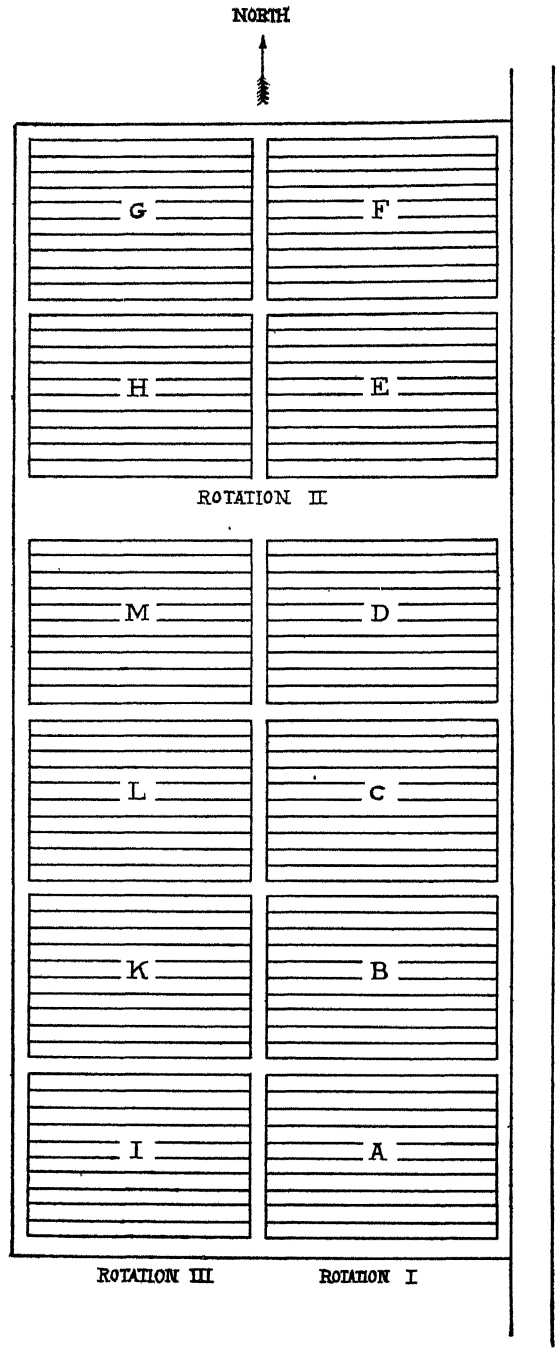


Diagram I. Arrangement of plots in cereal rotations, Miami County Experiment Farm.

THE FERTILITY TESTS

An experiment in the maintenance of soil fertility was planned and begun, to include three parallel 4-year rotations, namely:

I—Corn, oats, wheat, clover.

II—Corn, soybeans, wheat, clover.

III—Corn, corn, oats, clover.

The first and third of these rotations are in common use in different sections of the state. The second is introduced to ascertain whether it may be found advantageous to substitute the soybean for the oat crop.

TABLE II: Plan of fertilizing in cereal rotations, Miami and Paulding county experiment farms

Pounds of fertilizing materials per acre for each crop

Plot No.	Acid phosphate	Muriate potash	Nitrate soda	Lime carbonate	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
Rotation I: Corn, oats, wheat, clover										
	On Corn				On Oats			On Wheat		
1	...	..	..	.....	...	..	..	...	..	..
2	200	..	..	.....	100	..	..	200	..	..
3	200	50	..	...	100	20	..	200	20	..
4	...	..	..	.....	...	..	..	...	..	..
5	200	50	50	.....	100	20	30	200	20	80
6	200	50	50	4,000	100	20	30	200	20	80
7	...	..	..	.....	...	.	..	...	.	..
8	Manure, 8 tons		..	.....	...	.	..	200	50	50
9	Manure, 8 tons, phosphated				...	..	..	200	50	50
10	..	..	..	.....	...	..	..	...	..	..
Rotation II: Corn, soybeans, wheat, clover										
	On Corn				On Soybeans			On Wheat		
1	...	..	..	..	...	..	..	...	..	..
2	200	..	..	..	100	..	..	200	..	..
3	200	50	..	..	100	20	..	200	20	..
4	...	..	..	..	...	..	..	...	..	..
5	200	50	50	..	100	20	30	200	20	80
6	130	50	20	..	70	20	10	160	20	20
7	...	..	..	..	.	..	..	...	..	..
8	160	20	20	..	100	..	..	170	..	30
9	160	20	20	*	100	..	..	170	..	30
10	...	..	..	..	..	..	..	...	..	..
Rotation III: Corn, corn, oats, clover										
	On Corn 1st				On Corn 2nd			On Oats		
1	...	..	..	.....	...	..	..	...	..	..
2	200	..	..	....	200	..	..	100	..	..
3	200	50	..	.....	200	20	..	100	20	..
4	...	..	..	. ..	...	..	..	...	..	..
5	200	50	50	.....	200	20	80	100	20	30
6	200	50	50	4,000	200	20	80	100	20	30
7	...	..	..	....	...	..	..	...	..	..
8	Manure, 8 tons			.....	200	50	50	...	..	..
9	Manure, 8 tons, phosphated*				200	50	50	...	..	..
10	...	..	..	. ..	...	..	..	...	..	..

Miami only

*Catch crop to follow corn.

To each rotation are allotted 40 plots of land of one-tenth acre each, the plots being arranged in 4 blocks of 10 plots each, in order that each crop may be grown every year. The arrangement of these blocks is shown in Diagram II, and the plan of fertilizing is shown in tables II and III:

TABLE III: Plan of fertilizing in cereal rotations, Miami and Paulding county experiment farms. Total fertilizing materials for one rotation; constituents and percentage composition

	Total fertilizing materials for one rotation				Fertilizing constituents contained			Percentage composition		
Plot No.	Nitrate soda	Acid phosphate	Muriate potash	Total pounds	Nitrogen ammonia	Phosphoric acid	Potash	Ammonia	Phosphoric acid	Potash
Rotation I: Corn, oats, wheat, clover										
2	...	500	..	500	..	70	..	.	14	.
3	...	500	90	590	..	70	45	.	12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	160	500	90	750	30	70	45	4	9 5	6
8	...	300	..	300	9.5	28	25	3	9	8
9	...	300	.	300	9.5	28	25	3	9	8
Rotation II: Corn, soybeans, wheat, clover										
2	...	500	.	500	..	70	.	.	14	.
3	...	500	90	590	..	70	45	.	12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	50	360	90	500	9.5	50	45	2	10	9
8	50	430	20	500	9 5	60	10	2	12	2
9	50	430	20	500	9.5	60	10	2	12	2
Rotation III: Corn, corn, oats, clover										
2	...	500	..	500	..	70	..	.	14	.
3	...	500	90	590	..	70	45	.	12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	160	500	90	750	30	70	45	4	9.5	6
8	50	200	50	300	9 5	28	25	3	9.	8
9	50	200	50	300	9.5	28	25	3	9.	8

Four of the blocks in the experiments with fertilizers and manure—C, G, L and M—were planted in corn and fertilized according to plan, block M receiving the treatment designed for the second corn crop of Rotation III, and the results of the treatment are given in Table IV.

It never happens that the crop immediately fertilized or manured is able to consume all the plant food given, but a residue is always left over for succeeding crops. This may be explained on the assumption that the plant food in fertilizing materials is not all immediately available, or that part of it is locked up by the soil in temporarily unavailable combinations, or that its distribution through the soil is not sufficiently perfect to enable the crop to reach it all.

TABLE IV: Fertilizers on corn in Miami county. Results of treatment for 1911

Plot No.	Treatment per acre	Yield per acre		Increase per acre		Value of increase	Cost of treatment	Net gain (+) or loss (−)
		Grain bus.	Stover lbs.	Grain bus.	Stover lbs.			
	Rotation I—Block C							
1	None	31.14	2,490	.....	...	$....	$....	$....
2	Acid phosphate, 200 lbs.	33.43	2,700	4.77	250	2.38	1.52	+0.86
3	Acid phosphate, 200 lbs.; muriate potash, 50 lbs	35 57	3,250	9.38	840	4.69	2.67	+2.02
4	None	23.71	2,370	.....	...	....	.....	....
5	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs	34 57	2,930	10.14	563	5 07	4.05	+1.02
6	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs; Lime, 2000 lbs	36.71	2,970	11.57	607	5.78	10 00	−4.22
7	None	25 86	2,360	....	...	....	... .	....
8	Manure, 8 tons	32.86	2,340	9.38	173	4.69	.. .	....
9	Manure, phosphated, 8 tons	37.29	3,050	16.20	63	8.10	.....	....
10	None	18.71	1,800	.....	...	....	. ...	....
	Average unfertilized yield	24 85	2,255	.....	...	....	.....	....
	Rotation II—Block G							
1	None	38.57	2,050	....	...	$....	$....	$....
2	Acid phosphate, 200 lbs	48.43	2,190	8.24	73	4.12	1.52	+2.60
3	Acid phosphate, 200 lbs.; muriate potash, 50 lbs	51.57	2,550	9.76	367	4.88	2.67	+2.21
4	None	43.43	2,250	....	...	....	....	....
5	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs	49.57	2,700	6.85	387	3.42	4 05	−0.63
6	Acid phosphate, 130 lbs.; muriate potash, 20 lbs.; nitrate soda, 20 lbs	45.29	2,540	3.29	163	1.64	2.69	−1.05
7	None	41.29	2,440	...	...	...	...	...
8	Acid phosphate, 160 lbs.; muriate potash, 20 lbs.; nitrate soda, 20 lbs	45.14	2,740	7.85	287	3.92	2.23	+1.69
9	Acid phosphate, 160 lbs.; muriate potash, 20 lbs.; nitrate soda, 20 lbs	37.14	3,000	3.85	533	1.92	2.23	−0.31
10	None	29.29	2,480	....	...	....	....	....
	Average unfertilized yield	38.14	2,305	...	...	....	.. .	....

TABLE IV—Continued: Fertilizers on corn in Miami county. Results of treatment for 1911

Plot No.	Treatment per acre	Yield per acre		Increase per acre		Value of increase	Cost of treatment	Net gain (+) or loss (—)
		Grain bus.	Stover lbs.	Grain bus.	Stover lbs.			
	Rotation III—Block L							
1	None	19.00	1,900	....	...	$....	$....	$....
2	Acid phosphate, 200 lbs.	32.43	2,350	11.14	400	5 57	1.52	+4.05
3	Acid phosphate, 200 lbs.; muriate potash, 50 lbs	41.43	2,800	17.86	800	8.93	2.67	+5.26
4	None	25 86	2,050	.....	...	....	....	....
5	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs.	34.86	2,300	10.67	177	5.33	4.05	+1.28
6	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs. Lime, 200 lbs	34.43	2,600	11.90	403	5.95	10 00	—4.05
7	None	20.86	2,270	.....	...	....	. ...	....
8	Manure, 8 tons	37.00	2,490	17.57	310	8 78	.....	....
9	Manure, phosphated, 8 tons	34.86	2,300	16.86	210	8 43	.....	....
10	None	16.57	2,000	.....	...	....	.....	....
	Average unfertilized yield	20.57	2,055	....	...	....	.....	...
	Rotation III—Block M							
1	None	18 86	1,500	.....	...	$ ..	$.....	$....
2	Acid phosphate, 200 lbs.	31.29	2,080	10 67	457	5.33	1.52	+3 81
3	Acid phosphate, 200 lbs., muriate potash, 20 lbs	30.57	1,990	8.19	243	4.05	1.98	+2.07
4	None	24.14	1,870	.....	...	...	...	....
5	Acid phosphate, 200 lbs.; muriate potash, 20 lbs.; nitrate soda, 80 lbs.	28.14	2,050	4.38	183	2.19	4.18	—1.99
6	Acid phosphate 200 lbs.' muriate potash, 20 lbs.; nitrate soda, 80 lbs.	29.14	2,260	5.76	397	2.88	4.18	—1.30
7	None	23.00	1,860	.....	...	....	.....	....
8	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs.	35.86	2,590	12.05	637	6.02	4.87	—1.15
9	Acid phosphate, 200 lbs.; muriate potash, 50 lbs.; nitrate soda, 50 lbs.	33.29	2,370	8.67	523	4.33	4.87	+0.54
10	None	25.43	1,840	.....	...	....	.. ..	...
	Average unfertilized yield	22.86	1,769	.....	...	....	.....	....

Probably each of these factors has a share in the outcome. Hence the increase shown in this first experiment must be regarded as only part of what is to be expected when the treatment shall have had time to produce its full effect. As the work now stands, however, it is evident that in this first crop the acid phosphate and muriate of potash have paid their cost with a liberal margin to spare in every case, except when associated with nitrate of soda; the addition of the nitrate, however, has not increased the yield above that produced by the other two materials sufficiently to justify its cost.

Both plots to which lime has been added have produced a little more corn than the plots alongside which have received the same treatment except for the lime, but not enough more to pay for the lime. This, however, was not unexpected, as the major part of the effect of the lime is to be looked for in the crops following the corn, and especially in the clover crop.

VARIETY TESTS

CORN

In the Miami county corn test of 1911, 25 one-tenth acre plots were devoted to a comparison of different varieties and strains. As in the fertility work, every third plot is used as a check and is accordingly planted to one variety. In this test the Darke County Mammoth corn was used as check.

TABLE V: Comparison of varieties of corn in Miami county, 1911

Plot No.	Variety	Actual yield per acre		Increase or decrease (—)		Comparative yield per acre	
		Grain bus.	Stover lbs.	Grain bus.	Stover lbs.	Grain bus.	Stover lbs.
1	Darke Co. Mammoth, check	40.29	2,330	....	...	42.49	2,584
2	Cook's No. 75, smooth	44.00	2,750	2.24	230	44.73	2,814
3	Cook's No. 75, rough	46.14	2,800	2.90	90	45.39	2,674
4	Darke Co. Mammoth, check	44.71	2,900	....	...		
5	Leaming, smooth	43.71	2,650	—0.49	—200	42.00	2,384
6	Leaming, rough	42.29	2,300	—1.27	—500	41.12	2,084
7	Darke Co. Mammoth, check	43.14	2,750	....	...		
8	Dobbin's Reid, smooth	38.00	2,650	—3.86	—50	38.63	2,534
9	Dobbin's Reid, rough	44.57	2,500	4.00	—150	46.49	2,434
10	Darke Co. Mammoth, check	39.29	2,600	....	...		
11	Orcutt's Reid, smooth	39.71	3,050	0.80	483	43.29	3,067
12	Orcutt's Reid, rough	38.14	2,550	—0.38	—16	42.11	2,568
13	Darke Co. Mammoth, check	38.14	2,500	....	...		
14	Darke Co. Mammoth, smooth	42.57	2,520	3.10	37	45.59	2,621
15	Darke Co. Mammoth, rough	41.14	2,550	0.33	84	42.82	2,668
16	Darke Co. Mammoth, check	42.14	2,450	....	...		
17	Cook's No. 75	40.00	2,300	—3.43	—197	39.06	2,387
18	Clarage	37.71	2,000	—7.00	—544	35.49	2,040
19	Darke Co. Mammoth, check	46.00	2,590	....	...		
20	Zehring's Reid	41.71	2,700	—4.19	117	38.30	2,701
21	Strain No. 84	35.71	1,700	—10.10	—877	32.39	1,707
22	Darke Co. Mammoth, check	45.71	2,570	....	...		
23	Leaming	41.86	2,100	—2.95	—470	39.54	2,114
24	Stewart's Clarage	41.14	2,350	—2.76	—220	39.73	2,364
25	Darke Co. Mammoth, check	43.00	2,570	....	...		
	Average of checks	42.49	2,584				

A portion of this test was devoted to a comparison of rough and smooth dented types of five different varieties and strains. The rough and amooth seed used in the test was grown from the same types the year previous. The results of this test are recorded in Table V.

The comparative yields, as given in the last two columns, are secured by adding to, or subtracting from the average yield of all the check plots, the increase or decrease, as recorded in the the third and fourth columns. By this method differences in yield due to differences in soil conditions are pretty well eliminated

In so far as the smooth and rough types of ears are concerned the differences in yield are slight. In three cases the smooth type gave a slightly larger yield, while in two cases the rough outyielded. On the average the rough type leads by a fraction of a bushel.

For the sake of comparing all the varieties used in the test of the smooth and rough types with the other varieties of the test, all the different plots of each variety are arranged and the results combined in table VI. It will be noted that the differences in yield between Cook's 75, Darke County Mammoth, Orcutt's Reid and Dobbin's Reid are but a fraction of a bushel.

TABLE VI: Summary of Miami county corn test

Variety	Comparative yield per acre	
	Grain	Stover
Cook's No. 75	43.06	2,625
Leaming	40.89	2,194
Dobbin's Reid	42.56	2,484
Orcutt's Reid	42.70	2,817
Darke County Mammoth*	42.37	2,575
Clarage	35.49	2,040
Zehring's Reid	38.30	2,701
Strain No. 84	32.39	1,707
Stewart's Clarage	39.73	2,364

*Average of rough, smooth and checks.

SOYBEANS

A comparative test of 8 varieties of soybeans and one variety of cowpeas was also conducted. The limited space did not permit the use of the desired number of check plots, but two plots of the Medium Green soybeans indicate that this small area was quite uniform. The varieties tested and their yields of seed are given in Table VI. Beside three well known varieties, three special plant-row selections of a variety known as Medium Yellow (Ohio 7403, 7490 and 7495), one of the Medium Ohio (7476) and one of the Medium Brown (8455), as well as the New Era cowpea, were tested. The latter proved a failure and was not harvested.

TABLE VII: Soybean variety test in Miami county, 1911

Plot No.	Variety of strain	Color of beans	Yield per acre bus.	Rank in yield
1	Ito San	yellow	20.00	5
2	Ohio 7403	yellow	22.00	3
3	Medium Green	green	20.83	4
4	Ohio 7390	yellow	26 67	1
5	Ebony	black	23.33	2
6	Ohio 7476	olive	18.50	9
7	Ohio 7455	brown	19 33	6
8	Medium Green	green	19 17	8
9	Ohio 7495	yellow	19.33	7
10	New Era Cowpeas	mottled	.....	.

These yields are quite satisfactory considering the fact that soybeans had not been grown on this land before and no inoculation was used. It should be remembered however that one year tests are not conclusive as to the comparative value of different varieties.

CLERMONT COUNTY

The invitation from the Board of Commissioners of Clermont county to assist in selecting a farm for that county was received June 21st, and on July 6th, and again on August 22nd the Board of Control visited the county and inspected several locations in company with the Commissioners. The final selection was decided upon September 11th, when a farm of 130 acres was chosen, the farm lying on the south side of the Cincinnati and Hillsboro traction line at stop No. 39, about a mile west of Boston (Owensville P. O.)

The topography of the larger part of Clermont county is that of a high tableland, with occasional deep valleys leading to the Little Miami and Ohio rivers. These valleys, with the minor depressions leading into them, offer ideal facilities for drainage, of which, as yet, but little advantage has been taken. The farm under consideration slopes gently from the middle towards the north and south. At the south end it will be necessary to secure a drainage outlet through adjoining land, but the north end furnishes abundant outlet. No draining has ever been done on the farm, and the flat interior fields show evidence of water logging and hard usage. The soil is a yellow clay loam.

The buildings on this farm were an old brick dwelling, considerably out of repair, and a barn, the roof of which was falling in. The fall was spent in rebuilding the barn and hauling tile from Batavia and Williamsburg, four and six miles distant, for drainage.

The following plan of management for this farm was submitted to members of the County Agricultural Society and approved by them:

THE CLERMONT COUNTY EXPERIMENT FARM

PROPOSED PLAN OF MANAGEMENT

Lying at the gates of a great city, as does Clermont county, it would seem that the production of such articles of food as are least adapted to long transportation should occupy a prominent place in its agriculture. Only a small part of the total area of the county, however, is adapted to gardening and truck farming, and the Experiment Farm has been located on a soil representing the larger area, hence its work will be limited by the character of its soil.

The statistics of crop production for this county show that the leading crops have given the following average yields per acre, by ten-year periods, for the 60 years since 1850, when the collection of such statistics was begun:

Period	Yield per acre		
	Corn bus.	Wheat bus.	Oats bus.
1850-9	33.3	11.8	19 3
1860-9	28 8	8.8	18.8
1870-9	30 0	10.2	18.3
1880-9	26.6	8.9	17.5
1890-9	25.5	9.9	20.1
1900-9	24.8	11.1	

These statistics show that there has been a steady decrease in the yield of corn, and that the yields of all the crops are far too low for profit, thus indicating that the problems relating to the increase of soil fertility must be given first rank in the work of the county experiment farm.

The appearance of the land selected for the Experiment Farm, and also that of much of the land in other parts of the county, indicates that underdrainage is absolutely essential to its profitable cultivation, and the first work, therefore, will be to thoroughly drain such portions of the farm as may be selected for field experiment. It would seem well, however, to leave a small tract underdrained, and on this to locate an experiment planned to illustrate the effect of drainage.

The statistics of crop production indicate that systematic rotation of crops is not always practiced in the county, as the area devoted each year to corn is nearly as great as the combined areas given to wheat and oats, and is several times greater than that reported as in clover. The fact that crop rotation is absolutely essential to the attainment of the greatest economy in production has been repeatedly demonstrated, but it may be well to give a small area to continuous cropping as an object lesson on this point. What would seem to be of more importance is a trial of a few simple rotations, planned as an inquiry into the best system of rotation for the conditions of this county. Two rotations in common use in southern Ohio are a 3-year rotation of corn, wheat and clover, and a 5-year, or longer, rotation of corn, oats, wheat, clover and timothy, the timothy being allowed to stand until it no longer yields a profitable cutting. This practice has undoubtedly been a potent factor in reducing the crop yields in Clermont county to their present low average, and to this practice is probably due the reputation that timothy has attained of being a hard crop on the land; coming at the end of a long period of cropping with other plants of the same general character, it has found the soil depleted and has naturally left it more so.

A few years ago the production of timothy was of sufficient importance to justify making it a leading object of investigation in Clermont county, because of the demand for such hay for the feeding of city horses; but the present outlook is that the automobile and truck will soon replace the horse on city streets.

With clover, however, the case is wholly different, as the demand for milk and meat must inevitably increase with the growth of the city, and because of its great usefulness both in the production of these food necessities and in the maintenance of soil fertility, the clover crop should receive the most earnest attention of agricultural investigators throughout Ohio.

In Clermont county such attention is the more important because of the increasing difficulty experienced in growing clover in this section, and for this reason, if for no other, a careful study should be made of other plants belonging to the same general family as clover, with a view to their substitution for that crop.

Such a plant is the Soy or Soja bean, a Japanese plant which is being grown very successfully at the Central Station and on the district experiment farms. This plant is found to be well adapted to the climate of Ohio, and it is proposed to make a careful study of it on the county experiment farms already established in Paulding and Miami counties. Our present belief is that the soybean may be substituted for the oat crop over the southern half of Ohio with enormous advantage to the agriculture of that region. One of the great advantages of such a substitution has been discovered at the Central Station, in the fact that wheat following soybeans yields several bushels to the acre more than when it follows oats.

Alfalfa is another leguminous crop which should be carefully studied on the Clermont County Experiment Farm.

Clermont county's average oat crop, of less than 20 bushels per acre, is losing money every year for the man who grows it. True, the same may be said of the 11-bushel wheat crop and the 25-bushel corn crop; but Clermont county lies in the very heart of the corn belt, and there can be no question as to the possibility of the restoration of that crop to profitable production; while wheat is a crop of such vast importance to the human race that no effort should be spared to discover the conditions under which it may be profiably grown. Wheat is now yielding fairly renumerative crops under some of the treatments on the district experiment farms in Meigs and Montgomery counties, crops which certainly justify the expectation that a way will be found to produce wheat profitably in Clermont county. With oats, however, the case is different. Oats is distinctly a north latitude crop, attaining its greatest perfection beyond the northern limits of corn production, and it is highly probable that the energies of the Clermont county farmer can be much more profitably expended on some other crop.

ORCHARD WORK

The conditions of the Clermont County Experiment Farm, while not the best for fruit production, are sufficiently good to justify the giving of considerable attention to that industry, and it is proposed to start experiments in orcharding and the culture of some of the small fruits. Experiments in progress in other sections of southern Ohio leave no room to doubt that it is possible to make the apple orchard a very profitable feature of Clermont county's husbandry.

DAIRYING

Clermont county is well situated for the production of milk, and the entire energies of a large experiment farm might well be developed to this industry; but with the limited sum out of which must be provided drainage, buildings, teams, implements and other equipment, it will not be well to undertake any work along this line at present. But the system of management under which the problems of fertility maintenance may be most effectively studied will be just that best suited to dairying, and therefore the work should be so planned that milk production may be undertaken when conditions permit.

During the autumn the barn on this farm was rebuilt and a considerable amount of tile was brought on to be ready for laying in the spring.

HAMILTON COUNTY

The farm selected in this county lies on the west side of the Cincinnati and Hamilton turnpike and electric railway, about 4 miles north of Mt. Healthy. It consists of two farms, the front tract containing 105 acres with a good dwelling and two barns, the rear tract containing 111 acres with a 5-room house and small barn. The front tract lies quite level, with only sufficient slope for good drainage. The eastern half of the rear tract is not too hilly for cultivation, but the western half is very hilly and should remain in forest and pasture.

The following general plan for the management of this farm has been submitted to and approved by the County Agricultural Society:

THE HAMILTON COUNTY EXPERIMENT FARM

PROPOSED PLAN OF MANAGEMENT

The statistics collected by the township assessors in Hamilton county for the year 1910 show that in that year about 54,000 acres were devoted to the production of grains and hay, the produce of which, at current market prices, would have had a total value of about $800,000; about 42,000 acres were pasture, having a rental value of approximately $200,000; about 7,700 acres were in truck crops (not including market garden crops) producing an estimated value of $290,000; 2,200 acres were in orchard fruits, yielding about $19,000 in value, and 430 acres were in grapes and small fruits, producing nearly $32,000 in value.

The values are of course mere estimates, but they serve to show in a general way the trend of the agriculture of the county. It will be observed that the yields given for the tree fruits are extremely low, but it appears from the statistics of previous years that these figures fairly represent recent conditions. In the aggregate the figures show that about 90 percent of the total area in farms is devoted to field crops, and about 10 percent to truck crops and fruits, but the value of the truck crops and fruits amounts to nearly 30 percent of the total value of all produce.

A large part of the field produce is converted into animal products as shown below:

TABLE VIII. Animal products sold and estimated value. Hamilton county, 1910.

Item	Quantity	Value per unit	Total value
Milk	1,838 295 gals.	$ 0.14	$257,357
Butter	845,557 lbs.	0.27½	232,503
Cheese	23,030 lbs.	0.15	3,452
Eggs	555,482 doz.	0.20	111,096
Wool	4,664 lbs.	0.25	1,166
Beef cattle, No	272	75.00	20,400
Hogs, No	5,000	20.00	100,000
Total			$725,974

This statement shows that dairying is, as it should be, a leading industry in Hamilton county, the total sales of dairy products amounting to nearly half a million dollars.

If we had data showing the sales of poultry it is probable that the total revenue from poultry and eggs would amount to at least $200,000, thus bringing this industry into a still more important relative positive position than the figures indicate.

The prominence given to dairying in Hamilton county would justify the expectation of an increase in crop yields, provided the manure were carefully saved and utilized. The actual outcome is shown by the next table, exhibiting the average yields per acre of corn and wheat in Hamilton and adjoining counties by 10-year periods since 1850:

TABLE IX. Average yields in bushels per acre by 10-year periods

Period	Hamilton	Butler	Warren	Clermont
		Corn		
1850-59	38.2	41 1	40 4	33 3
1860-69	37.0	39.2	37.4	28.8
1870-79	36.4	42.3	40.9	30 0
1880-89	33.3	38.5	36.8	26.6
1890-99	30.6	35.1	35.1	25.5
1900-09	33.1	37.8	35.7	24.8
		Wheat		
1850-59	14.7	15.0	14.7	11.8
1860-69	10 7	12 1	11.6	8.8
1870-79	12.8	12.9	13.0	10.2
1880-89	13.7	12.9	12.0	8.9
1890-99	14.2	16.5	13.8	9.9
1900-09	15 9	15.6	13.9	11.1

The table shows a steady decline in the yield of corn for 50 years in all the counties, followed by a slight reaction during the last 10 years in all the counties except Clermont. In relative yield of corn Hamilton stands third.

The yield of wheat fell to its lowest point during the sixties, since which period it has been slowly rising. In relative yield of wheat Hamilton stands a little higher than either of the other counties during the last period.

How far the crop yields of this region are short of possible attainment is shown by the results of the work at the experiment farm at Germantown, Montgomery county, where the following yields have been harvested as an average for the 8-year period, 1894-1911 inclusive:

TABLE X Eight-year average yields at Germantowm Test Farm. Corn, wheat and clover grown in 3-year rotation

Treatment	Corn bus.	Wheat bus.	Clover lbs.
No fertilizer	44.0	9 7	2,405
Fertilized	60.9	20 1	2,669
Increase from fertilizer	16.9	10 4	1 264
Value of increase	$ 8.45	$ 9.36	$5 05
Cost of fertilizer	4.80	4.80	...
Net gain	3.65	4 56	5 05

The fertilizer, costing $9.60 for each rotation, is equally divided between the corn and wheat. The resulting increase has a total value for each rotation of more than $13.00 per acre in excess of the cost of the fertilizer, or about $4.40 per acre per annum. Such an increase in value of product on the 54,000 acres given to grains, meadow and clover in Hamilton county would amount to nearly a quarter of a million dollars annually.

In the light of this brief survey of the agriculture of Hamilton county it would seem that the work of the County Experiment Farm should be planned with a view to increasing the productiveness of the soil by systematic drainage, rotation, manuring and fertilizing; to increasing the returns from the dairy through improvement in the cow by careful breeding and selection, and improvement in the ration by better adaptation to its purpose; to increasing the returns from the poultry yard through breeding and feeding for special purposes; and to improvement in the production and quality of truck and fruit crops by selection of varieties adapted to the soil and climatic conditions of the county and by experiments in methods of management.

In the execution of this work it is proposed to devote about 20 acres of the farm to plot experiments in crop rotation with the use of fertilizers and manures, planned to articulate with those in progress at the Central Station and other district and county experiment farms. It will be necessary to use carefully selected land for this work, and to thoroughly drain it with tile drains. An equal, or larger area will be given to truck and fruit crops, including both small and large fruits, and the remainder of the tillable land will be devoted to a systematic rotation of field crops, grown to demonstrate in a larger way the effect of the small-plot treatment.

Because of the proximity of a great city, which has been taxed for the establishment of the experiment farm, it would seem obligatory that the work of the farm should be planned with the needs of the city in mind, than which there is none greater than a daily supply of pure milk; and therefore the production of such milk should occupy a leading place on the Hamilton County Experiment Farm.

It is therefore recommended that, after setting aside certain portions of the experiment farm for the purposes above mentioned and for poultry husbandry, the remainder of the farm be conducted primarily as a dairy farm, the cropping being planned for the most economical production of milk.

The increase of tuberculosis among dairy cattle during recent years has greatly complicated the problem of maintaining a dairy herd. It is no longer practicable to keep up such a herd by indiscriminate purchase, for such a practice is certain, sooner or later, to bring in this disease. The experience of the Ohio and Wisconsin Experiment Stations has demonstrated the practicability of building up and maintaining a sound herd of cattle, even on a tuberculous foundation, and has shown that after such a herd is established the only

sure way to maintain it is by avoiding the introduction into the herd of infected animals. Moreover, general experience has shown that the only way to secure a herd of high productiveness is by selecting the best milkers and breeding from them. It is proposed, therefore, to purchase a few cows of the best strains attainable and to keep the heifer calves until they can be tested as milkers, the cows and their produce to be used in experiments designed to improve the general character of the herd by eliminating inferior animals, and to increase the products by improvements in the ration.

Incidental to the production of milk will be the production, care and use of animal manure, and it is hoped that work may be accomplished along this line that will be of value to the farmers of the county.

HANCOCK COUNTY

In the spring of 1909 the Hancock County Agricultural Society and the Board of County Commissioners conveyed to the Experiment Station, by lease with nominal rental, a tract of 20 acres adjoining the county fairground and just outside the south corporation line of the city of Findlay, to be used for experimental purposes. This arrangement was entered into previous to the enactment of the county experiment farm law, and no provision was made by the county for equipment or current expense, hence this tract does not come regularly under the definition of a county experiment farm, but it seems advisable to report its work in connection with that of the county experiment farms.

Work was begun in the spring of 1909, the land being then an old sod. It had been uncultivated for probably ten years previously, having originally been part of the fairground. The land was laid out in 136 plots, mostly containing one-tenth acre each, 70 of which were devoted to the testing of various combinations of fertilizing materials, 48 to the comparison of varieties of cereals and 8 to an alfalfa test.

THE FERTILITY TESTS

Four blocks, of 14 plots each, were assigned to a 4-year rotation of corn, oats, wheat and clover, each crop to be grown every season, and one block of the same size was given to a similar rotation in which the oats crop is replaced by soybeans. This arrangement is much less satisfactory than to have each crop growing each season, because of the varying effect of different seasonal conditions, but the limited area of land left no alternative. The fact that a similar crop will be growing each season on some one of the blocks of the first rotation, except where soybeans are grown, will aid in drawing conclusions. Diagram II shows the arrangement of plots in this field, Table XI shows the plan of fertilizing, and Tables XII and XIII give the average results to the end of 1911.

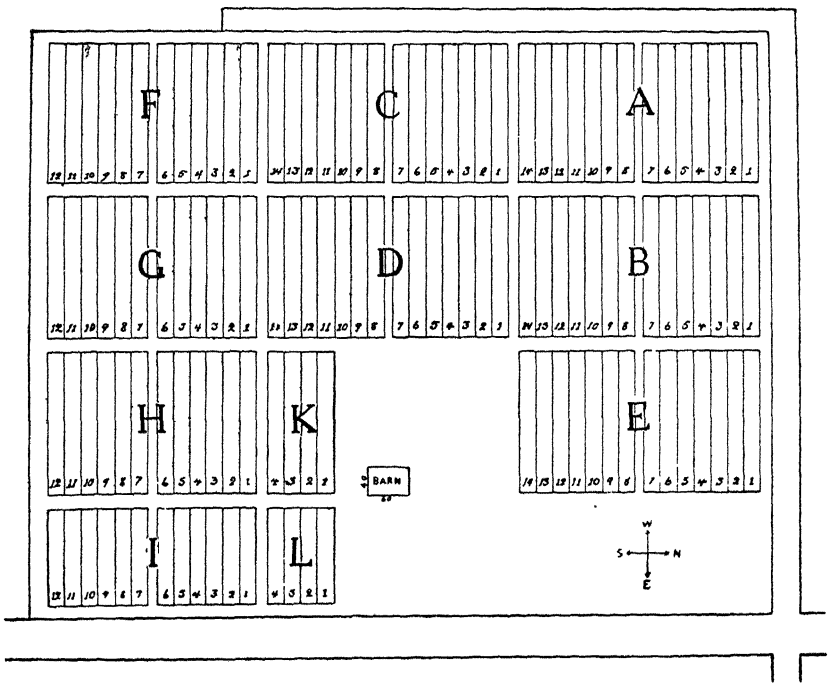


Diagram II. Arrangement of plots in Hancock County experiment field.

TABLE XI. Plan of fertilizing in four-year rotation of corn, oats, wheat and clover, at Findlay.

Plot No.	On corn				On oats			On wheat			
	Acid phosphate	Mur. of potash	Nitrate of soda	Lime	Acid phosphate	Mur. of potash	Nitrate of soda	Acid phosphate	Mur. of potash	Dried blood	Nitrate of soda
1	...	..	..	....	...	..	..	...	..	..	..
2	120	..	..	....	120	..	.	120	..	..	..
3	120	20	..	....	120	20	.	120	20	..	..
4	. .	..	..	....	..	..	..	. .	..	..	..
5	...	20	40	....	...	20	40	...	20	30	60
6	120	..	40	....	120	..	40	120	..	30	60
6	...	..	..	...	...	..	..	..	..	..	..
8	120	20	40	...	120	20	40	120	20	30	60
9	120	20	40	2000	120	20	40	120	20	30	60
10	...	..	..	....	...	..	..	..	..	..	..
11	A*	..	..	...	...	..	.	A*	..	..	..
12	A*	..	..	2000	120	..	..	120	..	..	.
13	.	..	..	....	...	..	..	..	..	..	..
14	120	A*	..	....	...	..	..	120	A*	..	.

A*—Barnyard manure, 5 tons per acre.

TABLE XII. Corn, oats and wheat in rotation at Findlay: Average yield and increase per acre.

Plot No.	Treatment	Average yield per acre						Average increase* per acre					
		Corn, 3 crops		Oats, 2 crops		Wheat, 2 crops		Corn, 3 crops		Oats, 2 crops		Wheat, 2 crops	
		Grain	Stover	Grain	Straw	Grain	Straw	Grain	Stover	Grain	Straw	Grain	Straw
		Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.
1	None	21.24	1,767	21.56	1,160	7.00	655	....	...	...	...	....	...
2	Acid phosphate	22.86	2,013	25.90	1,185	13 66	1,330	1.46	134	3.25	100	7.17	1,212
3	Acid phosphate and muriate of potash	27.85	2,223	25.47	1,280	14.08	1,430	6.29	342	1.72	270	8.00	848
4	None	21.71	2,103	24.84	935	5.49	545	...	...	....	...	....	...
5	Muriate of potash and nitrate of soda	27.62	2,560	29.06	1,125	8 50	890	3 00	307	3 49	173	1.20	178
6	Acid phosphate and nitrate of soda	31.76	2,547	35.62	1,175	17.66	1,990	4.24	143	9.32	207	8.55	1,112
7	None	30.43	2,553	27.03	985	10.91	1,045	....	...	....	...	....	...
8	Acid phosphate, muriate of potash and nitrate of soda	34 81	2,850	32.97	1,295	14.06	1,530	4 97	348	5 26	318	3 53	478
9	Acid phosphate, mur. of potash, nitrate of soda and lime	32.48	2,583	35.78	1,105	14.50	1,455	3.22	132	7.39	137	4.36	396
10	None	28.67	2,400	29.06	960	9 75	1,065	....	...	....	...	....	...
11	Barnyard manure	30.05	2,617	33 59	1,285	17.58	1,845	1.78	272	4 32	325	8.55	885
12	Barnyard manure, lime and acid phosphate	36.05	2,667	40 00	1,515	15.58	1,390	8.17	378	10.50	555	7.28	535
13	None	27.48	2,233	29.68	960	7.58	750	....	...	...	...	....	...
14	Barnyard manure and acid phosphate	30.95	2,470	33.75	1,205	18.83	1,720	3.48	237	4 07	245	11.24	970
	Average unfertilized yields	25.90	2,211	26.43	1,000	8 14	812	....	...	....	...	..	...

* In computing increase in these experiments it is assumed that if, for example, the yields of Plots 1 and 4, unfertilized, are 21 and 24 bushels, respectively, the unaided yields of Plots 2 and 4 would probably be 22 and 23 bushels. The average yield of all the unfertilized plots is given at the bottom of the table for the purpose of general comparisons, but it is not used in computing increase.

TABLE XIII. Corn, soybeans and wheat grown in succession on the same land (Block E); plan of fertilizing the same as shown in table XI.

Plot No.	Corn, 1909				Soybeans 1910		Wheat, 1911			
	Yield		Increase		Yield	Increase	Yield		Increase	
	Grain	Stover	Grain	Straw			Grain	Straw	Grain	Straw
	Bus.	Lbs.	Bus.	Lbs.	Bus.	Bus.	Bus.	Lbs.	Bus.	Lbs.
1	47.14	2,820	...	...	8.08	.....	3 83	420	...	...
2	46.67	2,940	0.29	220	8 62	0 40	16.17	1,030	1.73	480
3	50.38	2,960	4 76	340	8 46	0.25	12.83	1,360	7.27	680
4	44.86	2,520	....	..	8.21	....	5.67	810	...	...
5	48.09	2,900	—0 51	170	7.58	—0 77	8.33	900	2 16	37
6	57.52	3,260	5.17	320	8.79	0.31	12.67	1,540	6.00	623
7	56 09	3,150	....	..	8 62		7 17	970	...	...
8	57 36	3,205	5 09	137	8.29	0.14	17.67	2,190	11.22	1,293
9	52 96	3,025	4 51	38	8 41	0.74	20 16	2,690	14.44	867
10	44 63	2,905	...	..	7.20	.....	5.00	750	.....	...
11	52 50	3,127	1 87	2	9 00	0 48	9.17	1,550	4.23	797
12	52 67	3,145	—3.97	—200	10.37	0.53	15 67	1,860	10.78	1,103
13	62 64	3,565	..	..	11.16	....	4.83	760	.....	...
14	64.93	3,605	2 29	40	11 87	0.78	16.00	2,240	11 17	1,480
	[2]51.08	[2]2,992	[3]2 17	[3]119	[2]8.65	[3]0.32	25 34	[2]742	[3]7.67	[3]813

[1] Damaged by sparrows. [2] Average unfertilized yield. [3] Average increase from fertilizers.

THE CORN—OATS—WHEAT—CLOVER ROTATION

Three crops of corn have been grown in this rotation, on Blocks B, C and D, the corn thus growing each season on previously unfertilized land. The average unfertilized yield was 33.57 bushels per acre in 1909; 30.43 bushels in 1910, and 13.71 bushels in 1911, the crop being seriously injured by the drought of that season.

Oats followed corn on Block B in 1910 and on Block C in 1911, the unfertilized yields being 29.25 bushels per acre in 1910 and 23.62 bushels in 1911.

Soybeans were grown on Block A in 1909, without fertilizers. In the fall the land was fertilized according to plan for wheat and in addition lime was applied to Plots 9 and 12, and wheat was sown for the crop of 1910. Wheat also followed oats in regular rotation on Block B in 1911. The unfertilized yields of wheat were 11.46 bushels per acre in 1910 and 4.83 bushels in 1911.

These yields show that the land is in a low state of fertility, and Table XII, which gives the yield and increase for each treatment, shows that the very small applications of fertilizers and manure employed on this tract have made a small and irregular increase, yet there has been sufficient increase to much more than cover the cost of the fertilizer in most cases, with the clover crop yet to hear from.

Clover was sown on Block A in the spring of 1910 but the crop was practically a failure, no clover being harvested on Plots 1 to 7, inclusive. On the remaining plots the yields were as follows:

Plot 8	900 lbs.	Plot 12	620 lbs.
" 9	750 "	" 13	None
" 10	500 "	" 14	1100 lbs.
" 11	1200 "		

It will be seen that, with the exception of the small quantity harvested on Plot 10, the clover was found only on the land receiving a complete fertilizer or barnyard manure.

THE CORN-SOYBEAN-WHEAT-CLOVER ROTATION

The present outcome of this rotation, as established on Block E, is given in Table XIII, which shows in the wheat crop a very decided effect from the fertilizers, the yield on Plots 8 and 9, receiving the complete fertilizer, being more than three times as great as the average unfertilized yield.

In this rotation the wheat has evidently profitted by the cumulative effect of the fertilizers applied to the preceding crops. In the corn-oats-wheat-clover rotation the wheat harvested in 1911 likewise followed two fertilized crops, but that of 1910 was the first crop to be fertilized. The average increase of wheat from fertilizers in this rotation was greater by two bushels per acre in 1911 than in 1910.

No clover has yet been harvested in this rotation.

CONCLUSIONS

It is too early as yet to attempt to draw any but the most general conclusions from this work. It has been in progress but three years and thus neither of the rotations has been completed; it has not yet been possible to properly drain the land, and the irregularities due to previous treatment have been aggravated by insufficient drainage. Notwithstanding these drawbacks there are some points that may be accepted as indicating in a very general way what may be expected when the treatment has had time to accomplish more nearly its full effect.

In Table XIV is given the financial status of this work at the end of the third season, the value of the increase being computed on the basis of 40 cents per bushel for corn, 30 cents for oats, 80 cents for wheat, $8.00 per ton for hay, $3.00 for stover and $2.00 for straw—prices so much below those current at present that no allowance is made for the small labor cost of applying the fertilizers or harvesting and marketing the extra yield due to the fertilizer.

TABLE XIV. Experiments with fertilizers in Hancock county, 1909-1911.
Cost of treatment, value of increase and net gain or loss per acre.

Plot No.	Treatment per acre for entire rotation	Cost of treatment	Value of increase		Net gain or loss	
			Rotation I	Rotation II	Rotation I	Rotation II
2	Acid phosphate, 360 lbs.	$ 2 88	$ 8.80	$ 3 11	$ 5 92	$ 0.23
3	Acid phosphate, 360 lbs.; muriate of potash, 60 lbs.	4 38	11.13	9.41	6.75	5.03
5	Muriate of potash, 60 lbs.; nitrate of soda, 160 lbs	5.30	4.02	0 28	−1.28	−5.02
6	Acid phosphate, 360 lbs.; nitrate of soda, 160 lbs.	7 68	12.86	8.59	5.18	0.91
8	Acid phos., 360 lbs ; mur. potash, 60 lbs.; nitrate soda, 160 lbs	9.18	9.31	12 79	0.13	3.56
9	Acid phos., 360 lbs.; mur. potash, 60 lbs.; nitrate soda, 160 lbs.; lime, 2,000 lbs.	15.18	8.72	15.76	−6.46	0 58
11	Barnyard manure, 10 tons	....	13.26	5.89	....	....
12	Manure, 5 tons; lime, 2,000 lbs.; acid phosphate, 240 lbs.	7.92*	14.38	8.91	−6.80*	−4.90*
14	Manure, 10 tons; acid phosphate, 240 lbs.	1.92*	15.57	12.95	0 39*	5.14*

* Compared with manure alone.

The table shows that wherever the fertilizer has contained both phosphorus and potassium there has been a large increase in the total yield, but that when nitrogen in nitrate of soda has been added to this combination the net gain has been reduced because of the largely increased cost of the fertilizer. That the apparent reduction in yield on Plots 8 and 9, in Rotation I, as compared to Plot 2, is probably due to soil irregularity, and not to any injurious effect of the nitrate, is shown by the yield of the same two plots in Rotation II. The omission of phosphorus from the fertilizer, on Plot 5, has resulted in financial loss in both rotations.

Lime has not yet produced sufficient increase to justify its cost, but the chief effect of lime is likely to be shown in the clover crop, which is not yet fully in evidence.

In calculating the effect of the manure the excess of hay over 500 pounds has been added in the case of the first rotation. Taken as a whole, the results encourage the moderate use of manure and its reenforcement with acid phosphate, and also that of fertilizers carrying both phosphorus and potassium.

ALFALFA

Alfalfa was sown on Blocks K and L, July 13, 1909. Three cuttings were made in 1910. Following are the total weights obtained:

Block	Plot	Treatment	Yield per acre
K	1	Lime, 2,000 lbs	5,610 lbs.
	2	Lime, 2,000 lbs. + Steamed bonemeal, 300 lbs.	6,470 lbs.
	3	None	6,410 lbs.
	4	Lime, 2,000 lbs. + Manure, 8 tons	5,530 lbs.
L	1	Limestone dust, 4,000 lbs	6,750 lbs.
	2	Nothing	6,117 lbs.
	3	Steamed bonemeal, 300 lbs. + Nitrate of soda, 50 lbs. + Muriate of potash, 25 lbs.	6,400 lbs.
	4	Manure, 8 tons	5,784 lbs.

VARIETY AND CULTURAL TESTS

In 1910 the corn tests in Hancock county were devoted to a comparison of rough and smooth types of four varieties of corn and to a rate of seeding test. In selecting these types as wide differences were secured with reference to this character as possible. The results are given in Table XV.

It will be noted that the smooth types exceed the rough in yield by 1.79 bushel per acre. As carried on in five other counties of the state the same season the average gain for the smooth ears was 2.42 bushels.

TABLE XV. Corn: Rough vs. smooth-dented ears.

Variety	Type	Yield per A. bushels
Darke County Mammoth	rough	47.86
Darke County Mammoth	smooth	59.29
Cook's No. 75	rough	55.71
Cook's No. 75	smooth	55.71
Orcutt's Reid	rough	65.71
Orcutt's Reid	smooth	70.00
Leaming	rough	50.00
Leaming	smooth	41.43
Average of	rough	54.82
Average of	smooth	56.61

It should be recorded that in the second generation (1911) the rough types exceeded the smooth in yield by 0.74 of a bushel.

In testing different rates of seeding the corn was planted in hills 42 inches apart each way, and thick enough so that it could be thinned to the desired stand, viz., 2, 3 and 4 plants per hill. The maximum yield was secured with 4 plants per hill.

TABLE XVI. Corn: Thickness of stand.

No. of plants per:		Hancock Co.		At Wooster	
Hill	Acre	Yield per A. Bus.	Stover per A. Lbs.	Yield per A. Bus.	Stover per A. Lbs.
1	3,555	.....	.....	39.51	2,320
2	7,110	35.71	1,950	49.79	3,293
3	10,665	*48.92	3,095	58.86	3,940
4	14,220	51.43	4,359	63 39	4,432
5	17,775	.....	.....	62.33	4,921

* Average of two plots.

For comparison the 7-year average yields secured at Wooster are recorded in this table. While the yields have increased up to 4 plants per hill, the average size of the ears is much smaller, and the percent of nubbins much greater with 4 and 5 plants per hill than with 2 and 3.

In 1911, nine varieties of corn were compared on the 12 plots of Block I. The results are given in Table XVII.

The value of frequent check plots in reporting and correcting variation in soil conditions is apparent in this small test of only 12 plots, as will be observed by noting the yields of Plots 2, 5, 8 and 11. Plots 2 and 5 yield about the same and if we did not have the same variety growing on Plots 8 and 11 we should greatly overrate the varieties growing on Plots 7 to 12. Conditions which increase the yield of the check variety 27 bushels per acre may be expected to affect the other varieties in the same way.

TABLE XVII. Corn: Comparison of varieties in Hancock county, 1911.

Plot No.	Variety	Actual yield per acre		Increase or decrease		Comparative yield	
		Grain Bus.	Stover Lbs.	Grain Bus.	Stover Lbs.	Grain Bus.	Stover Lbs.
1	Darke County Mammoth	57.14	3,417	9.52	500	67.56	3,792
2	Clarage (check)	47.62	2,917	....	....	....	....
3	Leaming	55 96	3,500	8.74	611	66 78	3,903
4	Cook's No. 75	54.77	3,000	7.94	139	65 98	3,431
5	Clarage (check)	46 43	2,833	....	....	....	....
6	Funk's Yellow Dent	63 10	4,583	11.11	1,472	69.15	4,764
7	Ohio No. 84	66 68	3,500	9.14	111	67.18	3,403
8	Clarage (check)	63.10	3,667	....	....	....	....
9	Stewart's Clarage	75 00	3,750	7.93	55	65.97	3,347
10	Silver King	67.86	3,082	—3.17	—640	54.87	2,652
11	Clarage (checks)	75 00	3,750	....	....	....	....
12	Boone County White	77.38	5,000	2.38	1,250	60.42	4,542
	Average of check plots	58.04	3,291	....	....	.....	.....

TABLE XVIII. Variety tests of wheat, oats and soybeans in Hancock county.

Variety	Comparative yield per acre		
Wheat			
	1910—Block F Bushels	1911—Block S Bushels	Average Bushels
Velvet Chaff (check)	23.37	10.25	16.81
Poole	26.87	13.92	21.39
Fultz	24.43	9.30	16.86
Dawson's Golden Chaff	23.49	12.03	17.77
Gypsy	25.87	10.64	18.25
Nigger	21.54	9.53	15.53
Fulcaster	24.92	11.97	18.44
Mediterranean	28.48	11.19	19.83
Turkish Red	21.37	5.75	13.56
Oats			
	1910—Block G Bushels	1911—Block H Bushels	Average Bushels
Wideawake (Av. 4 checks)	55.47	24.76	40.11
Improved American	54.53	19.45	36.99
Siberian	60.16	.....	.....
Ohio 6203 (Siberian selection)	62 97	30.18	46.57
Swedish Select	60 27	24.03	42.15
Big Four	61.31	32.47	46.89
Silver Mine	60.06	31.12	45.59
White Russian	60.89	.....	.....
Sixty Day (Selection 7009)	63.90	25.38	44.64
Oderbrucker Barley	.....	4.47	.....
Emmer	.....	13.44	.....
Soybeans			
	1909—Block H Bushels	1910—Block I Bushels	Average Bushels
Medium Green (check)	10.75	19.48	15.11
Ohio 7454 (Brown)	13.88	18.03	15.95
Ohio 7476 (Olive)	14.78	20.97	17.87
Ohio 7422 (Yellow)	14.19	20 57	17.38
Ohio 7490 (Yellow)	15.49	18.28	16.88
Ito San	13.90	12.35	13.12
Wisconsin Black	6.59	5.82	6.20
Ohio 7406 (Yellow)	11.83	20.57	16.20
Ohio 7407 (Yellow)	15.42	20.31	17.86

Correcting the yields by means of the check, Funk's Yellow Dent stands first by a small lead, Darke County Mammoth, second, Ohio No. 84, third, and Leaming fourth. It should be stated that Funk's Yellow Dent was not as mature as the other varieties and when dried out would take a lower place.

Comparisons of different varieties of wheat, oats and soybeans are reported in Table XVIII. Most of these varieties were tested two consecutive years. The yields of such varieties are averaged in the final column of the table.

Of the different varieties of wheat the Poole has averaged highest in yield, the Mediterranean, second, Fulcaster, third, and Gypsy, fourth.

Of the oats varieties that were tested two seasons, the Big Four stands highest in yield; Ohio 6203, second; Silver Mine, third, and Sixty Day, fourth.

The Oderbrucker barley and Emmer were tested but one season, when they proved quite inferior to oats.

Of the soybean varieties, several selections of the medium yellow and olive lead in yield.

THE REQUIREMENTS OF A COUNTY EXPERIMENT FARM

As a movement is on foot in several other counties of the state to establish experiment farms under this law, the following suggestions are offered as to the requirements of a county experiment farm:

Area: The law provides that the farm shall contain not less than 80 acres; the chief reason for this requirement being that there should be land enough to give constant employment throughout the year to at least one man and team, experience having shown that if the person in charge of experiment work must look elsewhere than to the Experiment Station for part of his living the Station's work will invariably suffer. Another reason is that there should be land enough to permit some extension of work as new questions come up. Moreover, 80 acres is near the average size of the farms of the state, and it is often easier to secure a farm of this size on advantageous terms than a smaller one.

In some counties 80 acres will be entirely sufficient for such a farm, while in others it may be wiser to devote larger areas to its work. For example, 80 acres of land, all susceptible of plot work, might give greater opportunity for work than 500 acres of rugged hills and narrow valleys.

Topography: Flat land is not well suited to experimentation, because on such land there are always depressions in which water stands longer than elsewhere; but uniformity in the water supply is not less essential than uniformity of soil to the accuracy of a comparative test, hence the topography should be such that the water supply will be as uniformly distributed as possible.

On the other hand, steep hillsides are objectionable for field experiment, because of their liability to wash. The ideal topography for such work is a broad, gentle slope of one to two percent; but for orcharding and forestry, and for poultry or sheep or dairy husbandry, a hill farm may be well adapted.

Quality of soil: It is generally desirable that the land be under rather than above the average condition of the soil of the county in natural productiveness, for the reason that the improvement of impoverished land is one of the most important lines of work which the county experiment farm can undertake.

Location: The farm should be convenient of access. Where it can be located on an electric line the ideal situation will be attained. Only extraordinary fitness of a farm for this work will justify a location more than a mile from a railway station of some kind.

Buildings and equipment: The buildings needed by the county experiment farm will be just those of the better class of farmsteads of the state; that is, there should be a comfortable dwelling house, with not less than eight rooms unless there are other facilities for obtaining board and lodging within easy reach, for it will be necessary for representatives of the various departments of the main Station to make frequent visits to the county farms to look after the different lines of work which will be conducted on them. There should also be a good barn with stabling for several horses, for one or two cows for the superintendent, and for a few feeding cattle or sheep, as the production, care and use of manure will be one of the leading features of the work of many of these farms. It may be well to conduct some of these county farms principally as dairy farms, where dairying is the chief local industry, or as sheep, poultry or fruit farms, in the regions best adapted to these industries. Storage for implements and machinery will also be necessary.

All work involving the use of scientific laboratories and apparatus will be performed at the main Station.

The general equipment in tools, implements and machinery will be such as is required for the conduct of an ordinary farm, with the addition of wagon and platform scales, and in most cases of a small engine and thresher.

Cost of equipment: The cost of land and buildings will vary in different counties. In some cases it will be possible to set aside for this purpose lands already owned by the counties; in others it may be necessary only to add a few acres to such lands. In some cases sufficient buildings will be secured with the land; in most cases some new buildings, or rearrangement of old buildings will be necessary. The cost of teams, implements and machinery for an 80-acre farm will average not far from $3,000. In practically all cases some drainage will be necessary, and it will be conservative to estimate this item at not less than $500 under the most favorable conditions. Ordinarily it will amount to twice that sum or more, for dependable results in field experiment cannot be secured on undrained land.

Cost of maintenance: The law provides that the produce of the county experiment farm shall be used for its support, and that the County Commissioners may appropriate in addition not exceeding two thousand dollars annually for this purpose. Under ordinary circumstances an experiment farm cannot be self supporting, for if an experiment is to furnish trustworthy results the weighing, measuring and record keeping will often cost more than the manual labor. It has been ruled that no part of the money raised under bond issue for the purchase and equipment of the farm may be used for maintenance, hence the commissioners should provide this maintenance fund for the first year.

What may be expected of the county experiment farms: In the comparison of cereal varieties at the main Station, ten varieties of wheat have exceeded the Mediterranean in average yield for the 12 years, 1898-1909, the excess in seven of these varieties being from two to three bushels per acre. The average county in Ohio grows about 20,000 acres of wheat annually. An increase of one bushel per acre on this area for one season would purchase and equip an experiment farm. Some of the varieties grown at the Station are known to be unsuited to soils of a different character, and others which have acquired an excellent reputation in other regions have not done as well as the Mediterranean here. Local comparisons are therefore the only safe guide, and unless these comparisons are made under exact methods they may be altogether misleading. Corn is still more subject to the influence of local conditions than wheat.

As has been stated above, the Station's investigations on soil fertility have demonstrated the possibility of more than doubling the present yield of corn and wheat in Wayne county. This work has reached its culmination after years of groping in the dark, for

field experiment was an undeveloped form of research when the National experiment station law, known as the Hatch Act, was enacted in 1887. Two points, however, have been definitely worked out during these years: The first is that field experiment is the only method upon which a rational farm practice can be established, and the other is that this form of research requires years of work under the most exact methods before trustworthy results can be attained. A single season's work in the field may be altogether misleading; it is only when the work has been carried through a cycle of our ever changing seasons that we can be sure of the lesson taught.

The county experiment farm, therefore, is indispensable to the advancement of our agriculture, but it must have years for its work before its results can be definitely accepted.

The county experiment farm not a duplication of the main Station: As has been shown in the preceding pages, the work of the county experiment farms is being so planned as to study the problems of leading interest in each particular county, with only so much duplication of the work of the main Station or of other county experiment farms as is necessary for comparison. In fact, the problems requiring investigation in our agriculture are so numerous that if there were an experiment farm in every county each would have its own particular field of research. Moreover, it has been found possible to study at the main Station only a very few of the questions of importance in Wayne county, because of insufficiency of suitable land for field experiment, and were the counties immediately adjoining Wayne, and whose soil and climatic conditions most closely resemble those of Wayne, to establish experiment farms, the work on them would be made to supplement, not to duplicate, that on the Wayne county farm.