DEPARTMENT OF THE INTERIOR
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AGRICULTURAL INSTRUCTION IN THE HIGH SCHOOLS OF SIX EASTERN STATES

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No. 28. Monthly record of current educational publications, June, 1917.

No. 29. Practice teaching for secondary-school teachers. A. R. Mead.

No. 30. School attendance statistics, 1915–16. Clarence A. Perry.

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
Washington, January 16, 1918.

SIR: Believing that at its present stage of development, instruction in agriculture in schools of secondary grade might be improved and the general cause of agricultural education promoted by the publication of a clear and comprehensive statement of the character of instruction and the method of administering agricultural courses in some of these schools, I requested the director of the States Relations Service of the Department of Agriculture to detail its chief specialist in agricultural education, Mr. C. H. Lane, to visit and study certain high schools in six eastern States and prepare such a statement for this bureau. This was done on the basis of an agreement, in existence for several years, for the cooperation of this bureau and the Department of Agriculture whenever it may seem desirable. I am transmitting for publication as a bulletin of the Bureau of Education the result of Mr. Lane's work.

Respectfully submitted.

P. P. CLAXTON,
Commissioner.

THE SECRETARY OF THE INTERIOR.

AGRICULTURAL INSTRUCTION IN THE HIGH SCHOOLS OF SIX EASTERN STATES.

This report is a result of a cooperative agreement between the Bureau of Education of the Department of the Interior and the States Relations Service of the Department of Agriculture. The study included in this report was undertaken with a view to determining the character of instruction in agriculture in certain high schools in eastern States and the methods of administration.

General returns are given for the classroom, the laboratory, and in the adoption of home and school projects. The returns are based upon information obtained from teachers of agriculture in the States visited, supplemented by reports from students, by questionnaire, and by personal visit.

In all the States visited and reported upon there is an official in the State department of education who is responsible for the administration and supervision of agriculture in the high schools. These State officials were of great assistance to the investigator in getting at the real situation so far as methods of instruction and supervision were concerned.

METHOD OF CLASSROOM.

The use of textbooks was regular in some, usually in all, of the agricultural subjects. Ten high schools did not use regular texts, but made assignment of topic references in books or bulletins the basis of recitation. Such assignments were made to the class as a whole for recitation, and individually to members of the class for special report. The class recitation as heard did not seem to differ in plan from that of regular text classes, but individual reports appeared to call forth a rather more full and critical discussion by students than in the usual case. Pupils who would not think of disputing the findings of a book did not hesitate to differ with conclusions stated by a fellow student.

Even when the regular text was the basis of classroom work it was supplemented in 23 of the high schools by topic assignments, commonly in connection with projects, which is the usual method of applying classroom instruction to practical farming in the high schools visited. Under the influence of the project method of agricultural instruction, the tendency to break away from the textbook

order of topics was very marked. In that way the text is made useful in preparation for practical application, or more rarely, to answer questions already raised by participation of the pupils in some project activity.

A small number of teachers report some minor departure from the order of a text, while something like 90 per cent of the teachers made the text subserve their own notions of sequence in topics. It is not unfair to say that the great majority of the teachers serve as media for the interpretation of the texts rather than as teachers who make the function of the text an interpretation and supplementation of their own teachings.

Recitation.—As may be inferred from the foregoing, the question and answer method by which the teacher attempts to learn whether or not the class has read the assignment or listened to the lecture prevails in the classroom.

In 73 schools it was the major method of procedure in the classroom. Thirty-two schools used lectures in addition, only 7 high schools, however, making the lecture dominant. The latter procedure was found in those States where the project method of agricultural instruction has not become a fixed part in teaching, and also in most cases the teachers are those having been recently graduated from an agricultural college without having had courses in methods of teaching agriculture under the project plan.

Supervised study.—Provision for supervised study in the class period was made definite in many schools. Just what attempt is ordinarily made to help students study in this period it is hard to say. A few teachers spent the time set apart for study in completing their lectures and a few in a continuation of questions upon the text. Two sat down at their desks and left the class to its own devices. One assigned the writing of a brief composition upon farmyard manure and gave his time to aiding in organization.

METHOD OF THE LABORATORY.

In the laboratory in farm crops and soils the following of a series of set experiments by direction of a printed manual or mimeographed sheets was the usual procedure in two States. In most cases students work as individuals, each one responsible for the doing and recording of the whole number of experiments. The plan of procedure is that used in the physics and chemistry of the high school. In a few cases poverty of equipment was such that no ingenuity in the rotation of apparatus could give individuals a chance, and the class worked in groups.

The most common piece of apparatus in the schools is a hand-power Babcock tester. The presence of this piece of apparatus is

indicative of the dairy work of the high schools. The restriction of dairy laboratory work to milk testing in such schools is almost inevitable.

The amount of time given to testing milk is very variable. Sometimes merely a test by each boy or even by the teacher makes up all the work. More frequently, however, the work is motivated by testing of the pupil's home herd or individual cows. Sometimes the high school becomes the medium for testing herds in the community.

In farm management, laboratory work consists almost wholly in the working of problems in cost accounting, planning of rotations, and mapping of farms and buildings. To this is sometimes added survey work on the home farm or on neighboring farms. Field surveying with the compass, transit, level, or plane table may be a part of the work, though this is infrequent.

METHOD OF OUTDOOR WORK.

The home project plan of instruction was followed at every school visited. In all these schools observation is accompanied by or subordinated to practice in agricultural processes; that is, students do not only witness the processes of spraying, pruning, judging of live stock, selection of seed, working of farm machinery, and the like, but usually after a demonstration by the teacher take part in such activities themselves, not often enough to attain any marked efficiency, but sufficient to get a first-hand acquaintance with the nature of the work. In a few cases the organization of pruning or spraying squads, of judging teams, and the performance of community service gave sufficient practice to the attainment of unusual skill.

Only in the States of Pennsylvania, New York, Massachusetts, and New Hampshire are the agricultural teachers retained during the summer months for supervision of home project work.

The contents of the following State reports will give a more adequate idea in detail as to the method of administration and follow-up work in agricultural instruction.

MASSACHUSETTS.

STATE AID.

The Massachusetts system of vocational agricultural instruction includes separate classes and departments in high schools. In the case of a school the State pays one-half the maintenance expenses, in the case of a department two-thirds of the salary of the agricultural instructor.

Among the first steps toward securing State aid for an agricultural department in a high school, the following are of primary importance: (1) Request a conference with the agricultural agent of the State

board of education; the initiative may be taken by the local school authorities, or by any other interested persons; (2) appoint an advisory committee of five progressive farmers, including at least one farmer's wife, and, preferably, one or more of the parents of boys who will enter the agricultural course; and (3) show conclusively by petition that the town or city (*a*) understands what is proposed, (*b*) desires such a department, (*c*) will provide adequate funds for salary and equipment, (*d*) will provide proper quarters, (*e*) guarantees an adequate agricultural enrollment (15 over 14 years old, of whom at least 12 are boys, would meet this requirement), and (*f*) pledges the hearty cooperation of parents and other interested citizens for carrying out, under economic home-farm conditions, the productive projects to be taught and supervised by the agricultural instructor.

For the first year of an agricultural department in a high school $1,500 may be regarded as a moderate estimate—$1,200, or thereabouts, for salary and the balance for special agricultural supplies and equipment.

INSTRUCTORS.

The board of education has a voice in choosing only the teacher of agriculture. Cordial cooperation between the agricultural instructor and other members of the high-school staff may, however, be secured through the superintendent of schools. With him rests the selection of candidates for consideration by the school committee and nomination for the appointment of preferred candidate or candidates.

No man can be considered qualified for an agricultural instructorship who is not a good teacher and both able and willing to lead his boys in their practical work for the purpose of setting them a proper standard and giving them proper training for those phases of farming which require special knowledge and skill.

Professional improvement.—Since no young man entering upon the teaching of agriculture can be supposed to be a master of farming, either as a profession or as a business, the State board of education has made definite provision for professional improvement work. Each instructor must devote approximately two months a year to this purpose. One month is allowed for vacation, and nine months are devoted to teaching and supervision of projects.

Minimum qualifications of prospective instructors.[1]

(For county or separate agricultural schools and high-school agricultural departments.)

Specifications.	Farm work instructor.	Related study or technical instructor.	Farm work and related study instructor.	Nonagricultural instructor.
(1) *Age:*				
(A) Without successful teaching experience.	21	21	21	No such applicant considered.
(B) With successful teaching experience.	21	21	21	21.
(2) *Farm experience*	Eight calendar years under farming conditions like those in Massachusetts.	Two calendar years, and vacations during agricultural school or college course.	Eight calendar years in farming if only special agricultural courses have been taken; 4 calendar years in farming if 2 years or equivalent in agricultural courses have been taken.	Enough knowledge of farming to enable the instructor to understand the aim of vocational agricultural education, and a natural inclination toward the betterment of country living.
(3) *Academic education*	Grammar graduate	High school or agricultural school graduate.	High school or agricultural school graduate.	College or normal school graduate.
(4) *Technical education*	Special courses in agriculture.	Two years or equivalent in agricultural courses.	Two years or equivalent in agricultural courses.	Courses in subjects to be taught.
(5) *Professional education*	Approved study of home-project methods of teaching agriculture.	Courses in home-project methods of teaching agriculture and related studies.	Approved study of home-project methods of teaching agriculture and related studies.	Course in pedagogy and one year of successful teaching experience.
(6) *Personality*	Satisfactory and with presumption of ability to handle pupils (personal interview required).			
(7) *Physique*	Good health (attested by physician's certificate) and no deformity.	Good health (attested by physician's certificate).	Good health (attested by physician's certificate) and no deformity.	Good health (attested by physician's certificate).
(8) *Sex*	Men only	Men only	Men only	Men only.

[1] From Bul. Mass. Bd. Educ., 1916, No. 23, whole number 72.

By professional improvement is meant such programs of work, observation study, and lesson planning as shall be approved in each case from year to year by the board of education. An annual winter conference is held at the Massachusetts Agricultural College. The object of this conference is (1) to get hold of the specialists of the college for clearing up technical difficulties or getting from them technical information, such as advice on rations for dairy cows or poultry; (2) to get in touch with the county agents and those who are directing their work and assisting in the shaping of their policies, so that the activities of the county agents and those of the agricultural instructors when they touch shall be in harmony and be supplementary one to the other; (3) the discussion of methods of instruction. For a newcomer to the State such a conference affords an admirable opportunity to make first-hand acquaintance with the specialists on the college staff, and to know the doctrines they hold to be important for the improvement of Massachusetts farming. Usually a program of professional improvement consisting of one month of investigation at home, or at a distance, and one month of preparation of lesson outlines and teaching materials is to be preferred.

COOPERATIVE RELATIONSHIP.

The agricultural departments work in close cooperation with the Massachusetts Agricultural College and the United States Department of Agriculture in all joint undertakings, such as the promotion of club work, making of farm management surveys, demonstration of improved methods of farming. Instructors in departments cooperate closely with the farm bureaus in their counties. A Massachusetts law provides that there shall not be county agent farm bureaus in counties where there are county agricultural schools.

School projects are important for illustrating approved methods and providing convenient facilities for group teaching in observational and practice work; but more and more emphasis is being placed on home projects not merely because home projects are an aid to keeping the study of agriculture from being too bookish but because each project generally becomes a demonstration in its neighborhood of the better method of farming and is commonly followed in that vicinity, and because things done by farmers on their own farms are usually more convincing to farmers as to value of improved methods than are things done on the premises of the school.

COURSE OF STUDY.

In agricultural departments of high schools one-half the school day is devoted to project study and project work. The ratio of work to study varies from time to time and from season to season according to the requirements of the projects which are in prepara-

tion or under way. Agricultural departments are looked upon as being in session 40 weeks a year, generally from March 1 to Thanksgiving. The schools are looked upon as in session 50 weeks a year. All pupils keep accurate bookkeeping accounts and make written reports on their projects during the summer school vacation. Stimulated by frequent supervision, in some ways summer work is the most important teaching season of the year. Pupils in departments in high schools may devote one-half of their time to regular high-school subjects.

The curriculum of Hopkins Academy, as given below, is a fair example of courses in vocational agriculture and its relation to other subjects in the curriculum in vocational departments in public high schools.

Curriculum of Hopkins Academy.

FIRST YEAR.

Agricultural subjects.	Nonagricultural subjects.	Extras—Optional.
Study and projects in *Kitchen Garden:* Soil, seeds, vegetables, and small fruits. *Ornamental Planting:* Shrubbery, flowering plants, lawns. *Farm Shopwork:* Making and repairing for home and school, hotbeds, cold frames, and other garden equipment. (Four periods each day, 5 days each week.)	*English* (4 hours a week). Composition and application of literature. *Introductory or General Science* (3 hours a week). *Social Science I* (often called community civics)(3 hours a week). *Chorus Music*, 1-2. *Physical Training*, 2.	*Algebra*, 5. *Mechanical Perspective*, 3.

SECOND YEAR.

Study and projects in *Small Animals:* Poultry, bees, sheep, and wine. *Buildings and Equipment*, for small animals. *Home-Grown Crops* for small animals. *Farm Shopwork* allied to the projects.	*English* (5 hours a week). As in first year. *Biology* (plant and animal). Special correlations (5 hours a week). *Drawing:* Plans, sections, elevations, 2. *Chorus Music*, 1-2. *Physical Training*, 2.	*Geometry*, 5. *French*, 5.

THIRD YEAR.

Study and projects in *Farm Animals:* Types, breeding, management. *Dairy Management.* *Farm Buildings:* Sanitation and conveniences, plans, construction, etc. *Farm Crops* for keeping the animals, etc. *Farm Machinery and Implements.*	*English* (4 hours a week). *Chemistry* (5 hours a week). *United States History and Civics* (elective, 5 hours a week). *Chorus Music*, 1-2. *Physical Training*, 2.	*French*, 5.

FOURTH YEAR.

Study and projects in *Fruit Growing.* *Market Gardening.* *Buildings and Appliances.* *Management and Accounts.* *Farm Shopwork.* Entire half-day (usually afternoons) third and fourth year classes combined.	*English* (4 hours a week). *Physics* (5 hours a week). *Sciences*—all with strong practical application. Five hours includes double laboratory periods, counted as one hour only. *Chorus Music*, 1-2. *Physical Training*, 2.	*French*, 5. *Modern History*, 5. *Review Mathematics*, 5.

Farm shopwork.—In some departments most of the projects in farm shopwork are carried out in the winter during the special agricultural instructor's vacation and are taught by the manual training teacher. In such cases the projects are planned by the pupils and approved in advance by the agricultural instructor. In other cases the agricultural instructors themselves teach their boys all necessary projects in farm shopwork. This work includes, among other things, making and repairing for home and school use hotbeds, cold frames, etc.

Related study.—The agricultural instructors deal with the various sciences in the curriculum only so far as they have something which may be made to contribute to the understanding of efficiency of the agricultural projects.

In a department it is generally necessary for the agricultural instructor himself to sort out and teach most of the correlations of the various sciences with agriculture required for an understanding of his pupils' of their projects. He gives no attention to the teaching of any science as such. All of his teaching of botany, chemistry, physics, biology, mathematics, and accounting is confined to their applications to the projects of his pupils and the requisite skill and speed of his pupils in working out those applications.

It is the experience of Mr. R. W. Stimson, of the State board of education, that team work between the special agricultural instructor and the teacher or teachers of science and other subjects in the high school can not be counted upon. There have been encouraging instances of it, and there is to-day a tendency in all teaching toward correlating instruction with the environment of the pupils. Few distinctively agricultural pieces of apparatus are to be found in the science laboratories of high schools. A fair statement, therefore, of the prevailing conditions hardly warrants describing the training of agricultural pupils in high schools as being more than 50 per cent agricultural.

HOME EQUIPMENT.

No farm is required. Farm products, methods of production, farm buildings and equipment are studied on farms in the vicinity and at the homes of the pupils. Practice work under economic conditions is proving to be better than practice work under school conditions, providing practice work in the former case is given proper educational value by study at the school, in the greenhouse, and elsewhere, of all factors involved in the production and marketing of greenhouse crops.

Three high schools have fruit trees on the school premises which are taken care of by the pupils in the agricultural departments.

Several departments have conducted campaigns by pupils for eradication of nests of insects injurious to fruit, prizes being offered by local persons or organizations interested and by the State board of agriculture. As many as 1,200 trees have been pruned and sprayed in a single season by the pupils in a single department.

It is thought that there may be an advantage for a high school that has neither land nor live stock to have a well-rounded farm equipment of hand tools, including tools for pruning, sprayers, seed sowers, wheel hoes, and the like.

Classroom and its equipment.—Most agricultural departments are limited to a suitable combination room for study. Ordinary school desks are not suitable. In working out a problem in connection with the home project, more elbow room than that afforded by the ordinary school desk is required. Flat-topped desks, or table space measuring about 2½ to 3 feet per pupil, meet the needs of the agricultural classroom. The agricultural classroom generally presents the appearance of a combination of classroom and science laboratory. Water and gas are found to be highly desirable. The best books, bulletins, periodicals, and card-indexing systems dealing with agricultural subjects are available.

Several examples may be given of the work done in agricultural departments in high schools, but the department at Concord may suffice. This department occupies one floor of a two-story structure adjacent to the high-school grounds. Besides a small hallway, there is a large study and laboratory room, a smaller study room, and an office. The school grounds afford a limited amount of practice work in ornamental planting. Market gardening and fruit growing predominate.

It is this school that has established the most noteworthy cooperative arrangements with owners of greenhouses for practice work in growing market garden crops under glass. This department owns a considerable practical farm equipment, such as pruning tools, hand sprayers, and poultry appliances. Some of the best home project work in the State is being done by this department.

This has a two-teacher department, the enrollment having increased from 20 to 30. The outlay for special equipment, including classroom furniture, probably has not exceeded $1,500. The department renders valuable assistance to the local board of health by making a total solids and fat determination of nine samples of nine different milk dealers in the town on request. A sediment test is also made. The results of these tests are put on a woolen disk and exposed each month in the window of a local drug store, and the tests of the milk are posted in the local paper, a sample of which is here indicated:

I hereby certify that I have analyzed and obtained these results from the milk marked as follows:

	Total solids.	Fat.	Water.
Geo. B. Clark	12.90	4.25	Clean.
C. B. Jersey	14.19	5.85	Do.
A. H. Higginson	11.94	3.70	Do.
Chas. Moulton	10.39	3.20	Do.
Punkatasset farm	12.41	4.20	Do.
I. Lovering	11.47	3.84	Do.
Geo. Williams	11.78	3.90	Do.
Bonnie Brook	11.90	3.50	Do.
Simon Olsen	11.82	3.43	Do.
J. B. Cossar	11.48	3.65	Do.

HARRY E. TUTTLE, *Inspector.*

A recent bulletin of the Massachusetts Board of Education is entitled, "The County Agricultural School and the High School Agricultural Department in Massachusetts." Their requirements and advantages are stated and compared.

NEW HAMPSHIRE.[1]

LEGISLATION.

There is no direct State aid for vocational agricultural instruction in New Hampshire. The department of public instruction, however, does have the power of approval or disapproval of high schools, and disapproval of any given school operates to prevent that school from receiving tuition from pupils coming from towns having no high schools. In other words, indirectly a high school needs the approval of the department of public instruction in order to receive tuition pupils from towns authorized under the laws of the State to pay high-school tuition. Such authority given to the State department of public instruction secures identically the same results, so far as vocational agricultural instruction in the high schools is concerned, as in States having legislation providing for vocational agricultural instruction.

QUALIFICATIONS OF TEACHERS OF AGRICULTURE.

The department of public instruction acts in nothing but an advisory capacity so far as the appointments of vocational teachers of agriculture are concerned. The State department of public instruction requires as a condition of approval that teachers of agriculture shall be agricultural college graduates. All but 2 of the 30 teachers of agriculture in high schools are agricultural college graduates, and those 2 have done special work fitting themselves for teaching this work.

[1] The author is under obligation to Mr. W. H. Whitcher, of the State department of education, for valuable assistance.

COURSE OF STUDY AND EQUIPMENT TO BE APPROVED.

There is no hard and fast rule in regard to equipment. Schools in different sections of the State stress different lines of work; therefore the equipment has to be adapted to the particular course of study adopted by a given school and approved by the State department of public instruction. The course of study in agriculture, as indicated below, is a fair example of courses offered in the various high schools of the State:

Agricultural courses of high schools.

Courses.	Fall.	Winter.	Spring.	Summer projects.
Course I.....	Soil study (field work)—origin, classification, and adaptation.	Soil study (lab. exp.); study of fruit growing; seed selection and gardening.	Pruning and spraying; planting of gardens; planting of bush fruits; cultivation.	Horticultural.
Course II.....	Picking and packing of fruit; methods of propagation.	Grading fertilizers; study of field crops.	Tillage and cultivation; further fertilizer study.	Show results of cultivation and fertilization of soils for field crops.
Course III....	Study and judging of farm animals.	Farm animals (continued); dairying.	Dairying and feeding projects.	Continuation of feeding projects.
Course IV....	Farm management; cooperation in buying and marketing; farm accounts.	Study of text; rural law.	Rural law; report of projects.	

REQUIREMENTS OF STATE DEPARTMENT RELATIVE TO DUTIES OF AGRICULTURAL TEACHERS.

The State department of public instruction, in addition to the requirement that teachers shall be qualified, advises but has no power to demand that agricultural teachers shall be in charge of the work during the summer. As a matter of fact, however, 50 per cent of these teachers do inspect and supervise summer project work.

RELATION OF AGRICULTURAL TEACHERS TO BOYS IN THE GRADES AND THOSE IN THE COMMUNITY NOT IN SCHOOL.

Under a working agreement with the State College of Agriculture the teachers of agriculture and domestic arts supervise all of the educational activities relating to boys and girls in the community. This means that the teacher of agriculture must supervise the work in nature study and elementary agriculture in the seventh and eighth grades.

PROFESSIONAL IMPROVEMENT OF TEACHERS OF AGRICULTURE.

The State department of public instruction holds two conferences at which superintendents and headmasters and teachers of agriculture meet and discuss details of programs, methods of teaching, etc.

One of these conferences is in August, the other in December. No financial assistance is given to teachers along this line.

In addition to the above, the department holds eight or ten institutes in different sections of the State where groups of teachers of agriculture, domestic arts or mechanic arts, or commerce, meet in round table conferences and where for a day specific problems in administration or the pedagogy of these subjects are taken up. These constitute, according to the deputy State superintendent of public instruction in charge of agriculture, one of the most valuable agencies in shaping the work.

METHODS OF SUPERVISION.

The work of inspecting agricultural departments in high schools is provided for by one department official whose title is "Deputy State Superintendent in Charge of Practical Arts Division." Schools are visited from two to six times a year. The method of inspection consists of hearing classroom work, inspecting laboratory and greenhouse work, and visiting a few of the home projects. This latter, however, is practically impossible, owing to the fact that the deputy in charge has over 70 schools of all kinds to inspect.

The records kept at the office of the department of public instruction are practically only the general correspondence and occasional reports along specific lines of project work and the work reports mentioned.

So far as the records kept in school are concerned each school keeps such records as will enable it to fill out the work report, this work report being a very important document which teachers and superintendents understand must be made out in full at the close of the school year. (Sample attached.)

Name of school

.....

Agronomy.

Number pupils passed?.....Failed?.....Dropped course?.....
Texts used and amount covered

In about what proportion has time been divided between recitation or lecture .....and laboratory.....and field?.....
Approximate number of mathematical problems worked out.....
Number of class.....and individual.....experiments
Home projects: How many and what crops have been raised?
School projects: What, if any, have been carried out?

(Make report on extra sheets.)

Name of school

.....

Animal Husbandry.

Number pupils passed?.....Failed?.....Dropped course?.....
Texts used and amount covered

In about what proportion has time been divided between recitation or lecture .....and laboratory.....and herd study?.....
Approximate number of mathematical problems worked out.....
Number of class.....and individual.....experiments
Home projects: Detailed statement of.....
School projects in detail.....

(Make report on extra sheets.)

Name of school

.....

Horticulture.

Number pupils passed?.....Failed?.....Dropped course?.....
Texts used and amount covered?

In about what proportion has time been divided between recitation or lecture .....and laboratory.....and garden or hothouse?.....
Approximate number of mathematical problems worked out.....
Number of class.....and individual.....experiments
How many and what crops have been raised?
Home projects: Give full statement on additional sheets?
School projects: What, if any?
Briefly describe other agricultural courses, if any.

Teachers are supplied with available material and aided in the matter of method by the deputy in charge at the conferences above indicated and at the time of inspection so far as there is opportunity. It is found possible to discuss such problems as arise at least twice a year and frequently as many as five or six times a year. A great deal of assistance is given by correspondence, but in addition to all this the most important source of all help to the department is through the series of institute circulars which are prepared and sent out by the department.

HOME PROJECTS.

One of the absolute requirements of the department for continued approval of a school is that every pupil taking the course in agriculture shall carry on home projects in the line of horticulture, field crops, and animal husbandry, these projects to be of such a nature as to justify including them under the head of high-school work.

With reference to general requirements relating to projects, Mr. G. H. Whitcher, of the State department of public instruction, says:

All projects must be under the direction and supervision of the teacher. This work can not be confused with the numerous plans designed to meet the needs of adult farmers, because purely vocational aims have no place in the public school, owing to the age of pupils. Nor can it be organized along lines that are perhaps well suited to club activities, because these too often fail to meet educational needs by striving to combine vocational and social motives at an age that lacks experience to utilize the former and feels no need of the latter. Every high-school project must be the direct outgrowth of classroom preparation and presentation, because as pointed out in Circular No. 12, 1914–15, pupils are prepared for field work by the teacher, who must "give a connected statement of the important things to be seen (or done) and the reasons why they are important. This is the blazed trail through the wilderness that the pupil is to follow as he opens up a highway of knowledge."

A project is one step in an educative process, and the high school is by statute responsible to the State department of public instruction for the whole process in agriculture, as well as in Latin, English, geometry, etc.

Agricultural subjects can no more be delegated to outside administration than can translation in Latin, themes in English, mechanical drawing, or any other element of required school work.

The high-school teacher of agriculture working with and through his class must plan and execute all required projects and must personally know that a faithful attempt is made to secure worth-while results.

Pupils who fail to undertake projects must be reported deficient and can not graduate until the deficiency is made up.

Hopkinton High School.—In accordance with the New Hampshire State program of study, agricultural projects have been carried on successfully by R. W. Peaslee at the Hopkinton High School. This school is located in a section of the State where general farming is practiced. In addition, the attitude of the community toward the school is one of interest and cooperation, which fact adds in no small way to the efficiency of this system of teaching secondary agriculture. The plan of work falls under several heads:

1. A complete understanding is had by the instructor with the boy and his parents as to just what conditions and requirements are necessary for the boy to enter the agriculture course. Such points as use of land, team, etc., come up here for discussion.

2. The land for the project is selected in the fall by the boy and the instructor, and whenever possible, preparation of the land is started in order to facilitate the work in the spring.

3. All plans for the project are made in the winter as part of the school work, actual preparation of the land beginning in the spring as soon as weather conditions permit. Students are allowed time from school to do this work, provided it does not in any way interfere with other regular studies.

4. All work on the project is done by the student himself or under his direction, with the direct supervision of the instructor. Such

supervision necessitates visits by the instructor every two weeks or oftener as occasion may demand.

5. The incentive to the student is not given by holding before his eyes a "shiny" prize or the "mighty" dollar, but effort is made to have him carry on the project in a businesslike way, not losing sight of the facts that he is doing school work and that quality of product is paramount.

Results of garden projects.

Acres.	Amounts grown.	Cost.[1]	Profit.
Three-sixteenths	$48.00	$41.65	$1.35
One-fourth	47.78	37.10	10.68
Do	37.70	25.70	[2] 14.00
One-eighth	64.09	21.70	42.39
Three-sixteenths	73.10	37.30	35.80
One-eighth	69.34	15.00	54.34
One-fourth	134.18	34.86	[3] 105.37

[1] "Cost" includes labor income, reckoning man hours at 20 cents, and horse hours at 15 cents per hour.
[2] Includes $2 cash prize.
[3] Includes $5.75 cash prizes.

The State department of public instruction requires each high school offering an approved course in agriculture to hold a school exhibit of the products of home project work. An exhibit of this kind was held last year at the Hopkinton High School. All gardens were planned with a view to minimizing hand labor, horse cultivation being used, supplemented with as much handwork as was necessary. Some standard brand of seeds was used by each boy; while cabbage, cauliflower, and tomato plants were obtained from the school hotbeds.

All actual work was done by the students, the garden plan being worked out under the direct supervision of the instructor, and the work through the summer supervised by visits every two weeks and oftener, as was deemed necessary.

In addition to the regular garden project, one boy had a demonstration plat of alfalfa, another a plat of Canadian field peas, both trial plats planted from seed sent by the Government, the results in each case being sent in to the United States Department of Agriculture as per agreement. The alfalfa was inoculated with commercial culture.

As a part of the horticulture course, hotbeds were run near the school by the two upper classes. In these were grown lettuce, radishes, 50 dozen tomato plants, 800 to 1,000 cabbages and cauliflower. The total receipts were $10. This amount is small, owing to the fact that people are educated to buy a coarse-leafed, late tomato plant. The fine-leafed Earlina plants were sold at a sacrifice, but from the gratifying results obtained from them by all who purchased, a ready market is assured for all plants which can be raised next spring.

At this same school a series of home projects in poultry feeding, accompanied by marketing of products proved of high educational as well as economic value. In addition to this, the fact that two boys from this school went home and commenced complete reorganization of the farm only shows that this kind of school work does function in the improvement of agricultural practice.

NEW JERSEY.

According to Lewis H. Carris, assistant commissioner of education, any high school may introduce subjects from the field of agriculture as a part of the regular program of high-school studies. Such work is usually divided into specific subjects which bear directly upon agricultural work and are for the most part connected with the science work of the schools. Among the subjects possible are elementary agriculture (a study of some elementary text in agriculture), animal husbandry, agricultural chemistry, agricultural physics, fruit growing, field crops, horticulture, farm accounts, farm management, etc. Attention is called to the fact, however, that when this subject is introduced into a high school, it is necessary to secure a teacher who is both legally and professionally qualified to do this work. In agricultural science, a teacher who has had no agricultural experience usually fails to do satisfactory work.

STATE AID.

The State gives a quota from $200 to $400 to each high-school teacher, depending upon the length of the high-school course; and the work in agriculture, when approved by the State board of education, may be incorporated into any high-school course and the district will be assigned quotas for the work of teachers of agriculture.

VOCATIONAL SCHOOLS.

Under the provisions of the New Jersey laws for 1913 any present district, any union of two or more present districts, or any county may organize work in vocational agriculture.

A vocational agricultural school is a school, or a department in a school, under a special teacher or teachers where agricultural subjects with agricultural projects form the greater part of the program of studies. These subjects of study should be connected with definite projects which are worked out on the home farm under the supervision of the special teacher or teachers. The State board of education is ready to consider the approval of any definite scheme for providing a vocational training for apprentice farmers in any of the districts mentioned above. A few of the plans suggested are as follows:

1. Vocational agricultural department, which shall employ a teacher for the year around, who shall give definite instruction to a

group of boys during the winter months and supervise their work on the home farm during the summer.

2. A definite winter term for the instruction of boys who can not attend the regular high schools.

3. Definite expert supervision of agricultural projects carried on on the home farms during the summer months, supplemented by occasional meetings of pupils with the teacher.

4. Short unit courses which provide definite instruction in any one of the topics which are of value to a group of farmers in any community. The number of such short unit courses which can be given with profit is very large. For example, courses might be given in the judging of cattle, testing of milk, balanced rations, plant diseases, small fruits, poultry raising, etc. These short unit courses can be given in a series of 5 to 25 lessons, depending upon the character of the subject to be taught.

Particular attention is called to the fact that it is not necessary to have an experimental farm, equipment of building, and tools to carry on an agricultural school or department as indicated above. The laboratory is the home farm, and practical experience in the art of farming is gained by the students in definite projects of some financial importance.

State aid.—State aid to the extent of one-half the maintenance and equipment is provided to any district, union of districts, or county which organizes a vocational school or department. It will be observed that there is no minimum amount of State aid contemplated in the law.

Under the provisions for the establishment of vocational schools, New Jersey is carrying on probably the most unique experiment in the way of a vocational school system for a county that may be found in the United States. The vocational school system of Atlantic County consists of a board of education of five men and a staff of five men and two women, as follows: R. D. Maltby, director, four agricultural teachers, one of whom is also the chemist, a domestic-science teacher, and a clerk. The staff is engaged by the year, for the entire year. Each agricultural teacher is in charge of an agricultural school or center. Each school is fitted out with adequate furniture, books, and apparatus for conducting class work. The domestic-science department is fitted out with equipment for two unit kitchens. This outfit is transported to sections where the work is given.

The vocational schools also have a fully equipped chemical laboratory for analyses of soils, feed, fertilizer, etc. Agricultural schools are located at Pleasantville, Cologne, Hammonton, and Minotola; the chemical laboratory is at Pleasantville.

CLASSIFICATION OF EDUCATIONAL WORK.

Full time.—Men and boys above the age of 15 years taking three hours per day, five days per week, during the winter.

Full-time course.

Courses.	First year.		Second year.		Third year.	
	Hours.	Nature.	Hours.	Nature.	Hours.	Nature.
Project	7	Elementary	5		5	
General science	5	Soils	5	Crops	5	Live stock.
Home improvement.	1	Care of home grounds, etc.	1	Sanitation		
Shop	1	Use of tools	1	Farm mechanics		
Current topics	1-2		1			
Civics					1	Rural law.
Grammar					1	General principles.
Farm arithmetic					1	Percentage and accounts.
Agricultural engineering.					1	Farm surveying.
Care of animals					1	Prevention of disease.

Part time.—Men taking less than the above and confining most of their time to project study; class work done largely at night.

School pupils.—Pupils enrolled in public schools, above the seventh grade and over 15 years of age, taking not less than three hours per week. Studies consist wholly of elementary project study. Work taken in lieu of like number of hours of school work.

Lecture course.—Consists of groups of men and women in various sections of the county, meeting once or oftener a week during the winter for the purpose of discussing the agricultural problems of the community. Only those who desire take outside project.

Night classes.—Composed of men who meet once or oftener per week. Work consists of project study and problems of community interest, as control of diseases, fertilizing, etc.

Short course.—Two, four, or six weeks in length. Given for those who desire detailed information on certain subjects and are unable to attend a full-time course.

PROJECT WORK.

Project work consists of carrying out a systematic piece of work in the growing of a crop or some other farm activity that has previously been studied about in school, or expressed in other words, a practical demonstration of information gained in school. Project work is inspected weekly, or as often as necessary, throughout the growing season, by the teacher. Upon the results of the project the increased earning power of student is completed, though it does not represent all of the increased knowledge of the student

VOCATIONAL SCHOOL BULLETIN.

Beginning with the month of May, 1916, the vocational schools began the publication of the Atlantic County Vocational School Bulletin. The purpose of the bulletin is to furnish to the citizens of Atlantic County first-hand information of the activities of the vocational schools. The bulletin also includes seasonable notes on farm work, notices of agricultural meetings, and discussion of agricultural problems. The bulletin is sent free to all patrons of the vocational schools, to whom is extended the free use of its columns for the discussion of agricultural problems of community interest.

SOILS LABORATORY.

The soil laboratory is a result of the need and consequent demand of the farmers of the county for a place where questions regarding soils, fertilizers, spraying materials, seeds, etc., could be answered positively as to actual composition. Such answers can not always be given by simple examination by eye, nose, or tongue, nor by taking the word of the seller. More often the answer calls for apparatus and materials which give results which are measureable—weighable—and then these results are calculated in dollars and cents. Time is also an important factor in the money value of an answer, and the laboratory is, therefore, located within easy personal reach of all the farmers of the county. Farmers are always welcomed in the laboratory and the object lesson they receive by coming in actual contact with the scientific methods applied for their benefit results in gaining their confidence, not only in the vocational school, but also in the State College of Agriculture and the United States Department of Agriculture.

The equipment of the laboratory is limited to apparatus and chemicals required for determinations of a practical character and consists of the necessary chemicals and apparatus for chemical analyses, apparatus for physical analyses of soils, fertilizer and spraying materials, a compound microscope, seed-testing outfit, and a milk tester.

DEMONSTRATION WORK.

Demonstration work is understood by the vocational school staff to mean definite instruction on some farm problem at the farm and the carrying out of such instruction by the farmer. Demonstration work is always the result of a previous call either by phone, letter, or in person, for such instruction. Unless said instruction is followed out, the same is not regarded as a demonstration. Furthermore, practically all of the demonstration work performed by the vocational school staff is done while on the project visiting routes; and practically 90 per cent of all demonstration work is held with farmers who

have had some direct connection with the vocational schools, either as full time, part time, lecture course, or short course students. General demonstrations are held, where there are two or more persons present, on some fixed line of agricultural activity. General demonstrations are announced in advance and are held for the general instruction of the neighborhood

CLUB WORK.

During the summer of 1915 the vocational school staff assisted the county superintendent of schools in the supervision of the boys' and girls' agricultural and home making clubs. In 1916 the vocational school staff practically took over the entire supervision of this work. This year the scope of the work has been broadened until the club work now includes corn, potato, sweet potato, and girls' tomato growing and canning clubs. Improved seed corn was secured and furnished to the boys at cost; so the boys are the foundation of improving the standard of corn in the county. Buttons signifying that the boys and girls were members of the club movement were given all contestants. Frequent meetings of the contestants are held in the various school districts to keep up the interest and to instruct the boys in their work. The domestic science teacher held frequent demonstrations in canning of fruits and vegetables for the girls who are members of the girls' clubs. Mothers are also invited, so that the work has a broader influence. The enrollment in the various clubs of the county is as follows: Yellow Dent corn, 118; White Dent corn, 26; acre corn contest, 13; pop corn, 31; white potatoes, 49; sweet potatoes, 42; tomato growing and canning, 177; total, 456.

COOPERATIVE AGRICULTURAL CLUB WORK.

Until recently all the attention of agricultural experts has been directed toward the production of larger and better crops, without giving due consideration to the question of buying and selling or in any way endeavoring to help the farmer dispose of his produce systematically and economically. The vocational staff, however, has felt this need to balance production and has been able to inaugurate both buying and selling organizations among groups or clubs composed of farmers.

Where organizations were formed, prior to the advent of the vocational schools, every effort has been put forth to cooperate with them, but where none existed, efforts have been directed toward organizing such an association, conforming to the needs of the community. There is now established one or more such associations in each of the vocational school districts.

VOCATIONAL SCHOOL LABEL.

Never in the history of agricultural extension work has a public organization issued any method or means of guaranteeing the farmers' products. This action evolved from the belief that education in grading, packing, and marketing was incomplete without the money measure of that education.

The vocational schools, therefore, designed a label which is given free of charge to the students for their use, providing they implicitly follow rules prescribed. The label states that the goods are "Graded and packed under direction of Atlantic County Vocational Schools." Space is provided for the marks of the grades and types of products. Furthermore, each user has a serial number which the schools place upon the label. This serial number is for the use of buyer or consumer who has objection to the quality of produce in package, and by stating that number in correspondence with this system of schools the matter is investigated, and if the farmer fails to conform with the rules of grading and packing, adjustment is made and the farmer forfeits the privilege to further use of the label.

That it is a guarantee and efficient in its purpose is exemplified by the fact that an additional $1 per crate has been continuously received for strawberries, and other produce has brought proportionate additional returns.

IMPROVEMENT OF RURAL SCHOOL GROUNDS.

In cooperation with the local school boards the members of the staff have assisted in helping to improve the appearance of several schools and their surroundings. The most decided work was performed at Bargaintown and Minotola, where plans for the improvement of the grounds were first drawn and then the work done according to the specifications. This work has only commenced, as several requests have since been made for assistance, which indicates the interest that has been aroused in this activity. The time is rapidly approaching when public-spirited men and women will realize the importance of keeping the school grounds neat and attractive. Already the lessons learned in this work at school are being applied at home.

LIBRARIES.

The library in the vocational schools is equipped with 433 books covering problems on fruit and vegetable growing, insect pests and diseases, fertilizers, general farm crops, farm management, poultry husbandry, general animal husbandry, and general farm life, together with a full list of available bulletins and reports from the New Jersey Experiment Station and the United States Department of Agriculture at Washington, also many bulletins from State experi-

ment stations through ut the United States. All the books, bulletins, circulars, pamphlets, and news letters belonging to the vocational schools and pertaining directly to the science and art of agriculture are at the disposal of all patrons of the vocational schools. Few of the above books are used as textbooks, though most of them are used strictly as references in working out project outlines. The vocational schools are also equipped with a full set of project outlines compiled and written by the vocational school staff. The library in each school is open special evenings for the use of those who wish to come in and read, as well as to get books for home reading. A few agricultural periodicals are kept at the various centers. Weekly news letters from the State experiment station and Federal Government are posted where they are accessible at all times. The use of agricultural reading matter, especially agricultural literature, has been stimulated in the farm home. Nearly 50 per cent of the books owned by the vocational schools are in circulation throughout the year. Many bulletins have been ordered and books purchased through the instrumentality of the vocational school staff.

AGRICULTURAL MEETINGS.

The vocational school staff has exerted its influence in the development of social and economic betterment of farm life. The members of the staff are members and officers and are frequently in attendance at the meetings of all agricultural associations of the county. They have also been instrumental in assisting in the organization of poultry associations, subordinate granges, and Pomona Grange and agricultural clubs. This activity is no small part of the work of the vocational school staff, as there is many a week in which the instructor attends four or five meetings. The attendance in agricultural meetings is practically always accompanied by a talk and a round-table discussion.

FARMERS' WEEKS.

Farmers' week consisted of a series of five evening meetings, each meeting being devoted to a distinct branch of agricultural work, as fruit growing. One night of each series was always devoted to the ladies with special attention given to general rural improvement. Two and three lectures were given each night, after which a general round-table discussion followed. The meetings were presided over by prominent farmers of the community, who always lead the discussions. In Hammonton and Cologne a committee of the farmers has been appointed to assist in the perpetuation of the movement.

Five series or farmers' weeks have been held since the inauguration of the vocational schools; two at Minotola, two at Hammonton, and one at Cologne.

NEW YORK.[1]

SCHOOLS OF AGRICULTURE, MECHANIC ARTS, AND HOME MAKING.

State aid.—For many years the New York State Education Department has recognized agriculture as a proper subject for school study, and 10 years have passed since the first outline of a course in agriculture was included in the courses of study for secondary schools. Not until 1910, however, was there any provision made for instruction of a vocational nature. At this time the legislature enacted a law authorizing the commissioner of education to apportion public money for the partial support of schools of agriculture, mechanic arts, and home making. In 1913 this law was amended to its present form. The following indicates the main provisions of the present law and amendments.

1. Such schools may be established in union free school districts or in common-school districts when authorized by a district meeting.

Practically all village schools are in union free school districts, while nearly all the small country schools are in common-school districts. This permits any public school in the State to undertake the work, even though it does not maintain a high-school department. It should be noted, however, that the school may be authorized only by a vote of the district.

2. Such schools are to be under the direction of the authorities that have charge of other public schools of the district.

This is to insure the incorporation of the vocational work as an integral part of the established school system.

3. The commissioner of education shall annually apportion a sum equal to two-thirds the salary of the first teacher and one-third the salary of each additional teacher, also $200 additional if such teacher is employed for the full year (includes summer vacation), provided—
   (*a*) No change of teacher is made.
   (*b*) Such school may be a department or course of instruction established and maintained in a public school.
   (*c*) Such school has an enrollment of at least 15 pupils.
   (*d*) Such school maintains an organization and a course of study and is conducted in a manner approved by him.

The most important factor in successful school work is the teacher. The apportionment of a fractional part of the teacher's salary instead of a lump sum tends both to secure better salaried teachers and to warrant a yearly increase sufficient to retain competent teachers. The provision for summer employment makes possible an effective teaching plan.

4. All money so apportioned is to be used exclusively for the payment of the salaries of the teacher.

[1] The author is under obligation to Mr. L. J. Hawkins, of the State department of education, for valuable assistance and material found in this report of New York schools.

METHODS OF ADMINISTRATION.

The administrative and educational work of the State education department is performed by the commissioner of education, 3 assistant commissioners of education (1 of whom is deputy commissioner), and 14 divisions or bureaus.

The division of agricultural and industrial education has charge of State-aided vocational instruction and general supervision of courses of study and projects of a vocational nature.

QUALIFICATIONS OF TEACHERS.

No teacher may legally be engaged for vocational work who has not a special certificate, which requires, generally, evidence of graduation from an approved high school or the equivalent, and also from an approved professional institution wherein the candidate completed a four-year course of study in the subjects to be taught. Since the State pays two-thirds of the salary of the first teacher and one-third of the salary of each additional teacher of vocational subjects it is incumbent upon the division of agricultural and industrial education to insist that only the best available teachers be engaged. Boards of education are, therefore, advised to consult with this division before contracting with their vocational teachers.

The following points are brought to the attention of boards of education as to what is to be kept in mind in selecting a teacher of agriculture:

1. A teacher of agriculture should be thoroughly conversant with farm life, either through his home life or extended experience working on a farm.

2. A teacher of agriculture in a secondary school should not be a specialist in one or two agricultural subjects, but should have a good general knowledge of the entire field, including soils, animal husbandry, dairy husbandry, poultry husbandry, farm crops, fruit growing, plant diseases, farm machinery, etc.

3. A teacher of agriculture should have some knowledge of the science and art of teaching, gained either through special study or from teaching experience. A thorough knowledge of agriculture may be of little use unless the teacher has also some knowledge of how to direct the activities of pupils.

4. A teacher of agriculture should understand the intent of vocational agriculture, should be familiar with the farm home, and should understand the problem of connecting the school work and the home activities of the pupils.

5. A teacher of agriculture should have some knowledge of mechanical drawing, woodworking, and elementary blacksmithing.

TYPES OF SCHOOLS.

Two general types of agricultural schools in New York are recognized by the education department, namely:

1. *Intermediate schools of agriculture, mechanic arts, and home making.*—These are small schools of distinctly rural type offering four years of vocational work based upon six years of elementary school work. This type of school is not maintained in connection with any other secondary school course or department. These

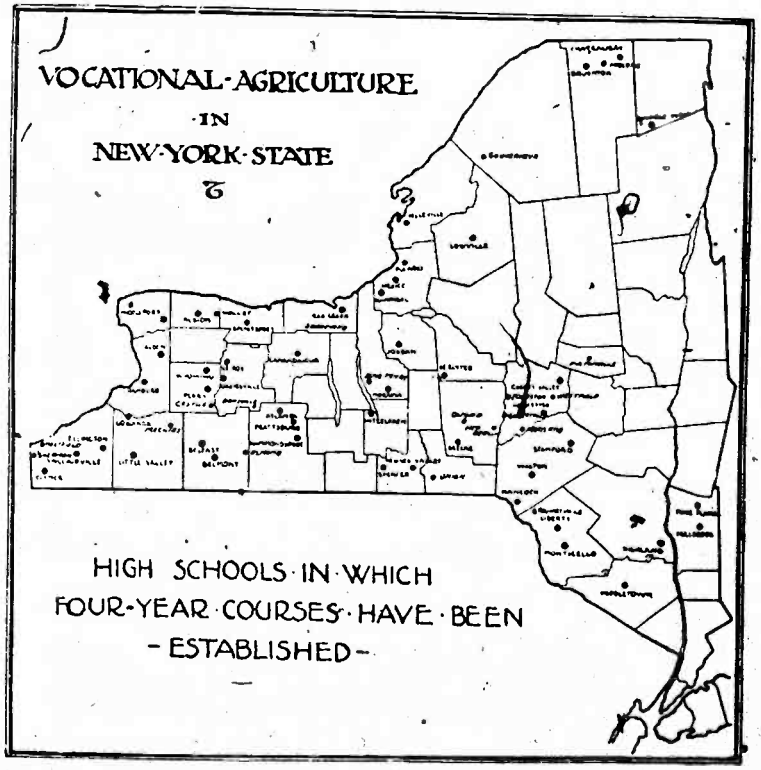

FIG. 1.

schools are planned for districts which do not at present maintain an academic department. Districts now maintaining an academic department of junior or middle grade may reorganize and establish an intermediate school. The course is so organized that pupils who are graduated from the intermediate school may complete an approved high-school course by two years of additional work.

In addition to the elementary teaching staff, there are three vocational teachers: (1) A principal qualified to teach agriculture, (2) a woman qualified to teach home-making subjects, (3) a teacher

qualified to teach English, history, etc. Each of these teachers holds a special vocational certificate for the particular work in which he or she is engaged.

CURRICULUM OF AN INTERMEDIATE SCHOOL OF AGRICULTURE.

	Hours a week.
FIRST YEAR.[1]	
English	5
Arithmetic	5
Geography	5
Agriculture or home making	10
SECOND YEAR.	
English	5
Mathematics	5
History	5
Agriculture or home making	10
THIRD YEAR.	
English	3
Mathematics	5
Biology	5
Agriculture or home making	10
FOURTH YEAR.	
English	3
History	3
Mathematics	5
Agriculture or home making	10

2. *High schools of agriculture, mechanic arts, and home making.*—These are vocational departments of high schools located in villages and rural communities. Pupils in these departments recite English, history, etc., in common with pupils in other departments of the school. It is, therefore, assumed that the principal of the school is also principal of the school of agriculture, mechanic arts, and home making. Official communication comes from and is directed to him.

CURRICULUM OF A HIGH SCHOOL OF AGRICULTURE.

	Hours a week.
FIRST YEAR.	
English	4
Algebra	5
Biology	5
First-year agriculture or first-year home making	10
SECOND YEAR.	
English	3
Plane geometry	5
History	3
Second-year agriculture or second-year home making	10
THIRD YEAR.	
English	3
Physics or chemistry	5
Third-year agriculture or third-year home making	10
FOURTH YEAR.	
English	3
American history with civics	5
Fourth-year agriculture or fourth-year home making	10

In New York State the number of public high schools teaching agriculture, mechanic arts, and home making increased 300 per cent in five years, as follows: 16 in 1911–12; 25 in 1912–13; 34 in 1913–14; 47 in 1914–15; 64 in 1915–16.

CURRICULUMS AND COURSES OF STUDY.

The classroom and laboratory instruction is based upon the practical experience gained on the farm, at home, or elsewhere. It is,

[1] Seventh school year.

therefore, impossible to prescribe uniform courses of study or to prepare adequate outlines for particular subjects. This does not mean that the courses of study of a school are changed to suit the whims of pupils who do not know exactly what they want or need. Definite courses of study are formulated at the beginning and are followed until there is urgent need for a change. A well-balanced general knowledge of the entire field of agricultural science and practice is represented in each curriculum.

The foregoing curriculums are not prescribed, but any school desiring to make any change secures the approval of the division of agricultural and industrial education before doing so. Other subjects, after approval, are substituted for those indicated above. The arrangement of subjects and the content of those subjects are suited to the community in which the school is located.

ROOMS AND EQUIPMENT.

Since agriculture deals with concrete material and is to a great extent objective, much of the time occupied in this study is spent in the field and laboratory, connecting in as many ways as possible everyday objects and occurrences with the general principles of science. For this purpose the barns, machinery, herds, flocks, fields, and crops of neighboring farmers are usually accessible and available. This means that the cost of material equipment at the school is low. Five hundred dollars is the amount advised to be included for equipment in the budget of a school starting the work. It is required that the rooms and equipment provided for this department shall be as modern and convenient as for any other part of the school. Rooms are not used for this work unless they are well heated, lighted, ventilated, and perfectly sanitary.

THE LABORATORY.

The purpose of the laboratory and its equipment is supplementary to that of the field. It furnishes a means for demonstrating various phases of agriculture and affords an opportunity for securing individual experience. One large room properly equipped to serve as a combination recitation room and laboratory has been found most satisfactory. It frequently happens that an exercise may be part recitation and part laboratory. Material and apparatus commonly used in the laboratory are also usually necessary for classroom demonstration. Centering all work and materials in one room saves time and trouble. A chair with a drop arm makes the best seat for such a room. When the arm is lowered, the chair may be used at the side table. For any demonstration exercise, such as butter or cheese making, the center of the room may be cleared and plenty

of space provided for the work. When any great amount of dairy work is indicated in the course of study, a special cement-floor room is provided and properly equipped with the necessary appliances

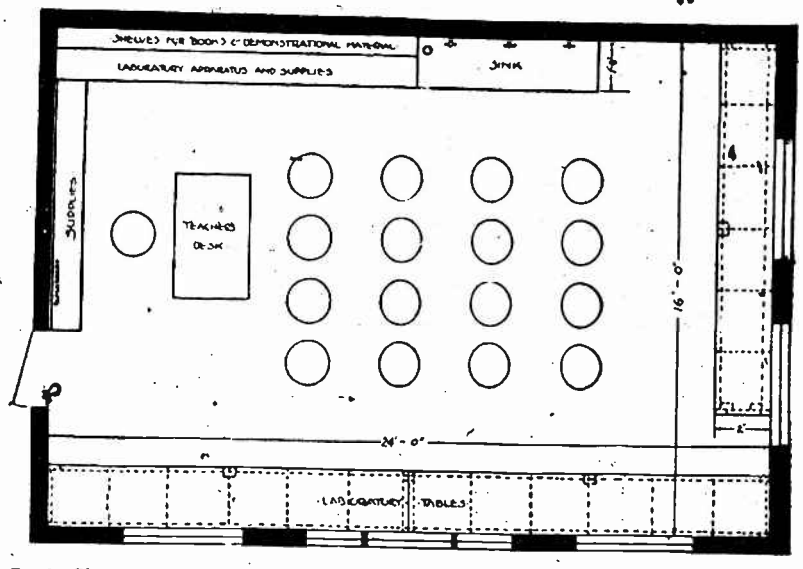

FIG. 2.—Plan of combination laboratory and recitation room for agriculture recommended by the New York State Educational Department.

of a home dairy. These rooms have running water, and gas when possible. When gas is inaccessible, alcohol, or other burners, are

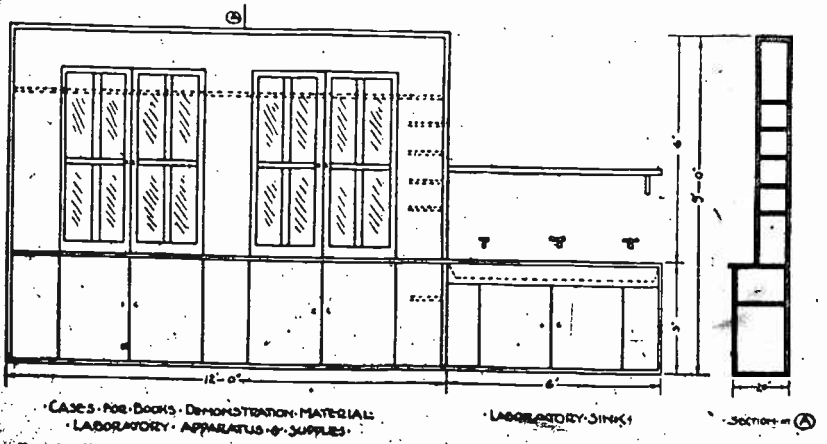

FIG. 3.—Elevations of cases for books, demonstration material, apparatus, and supplies shown in the plan.

provided. The agriculture room is near the ground, with easy access to the outside of the building, so that classes may readily pass in and out without disturbing others in the building.

Ample case room is provided for apparatus, laboratory supplies, and demonstration material. The upper doors are of glass, so that material may be readily located. The lower doors are of wood, since glass so low down is frequently broken.

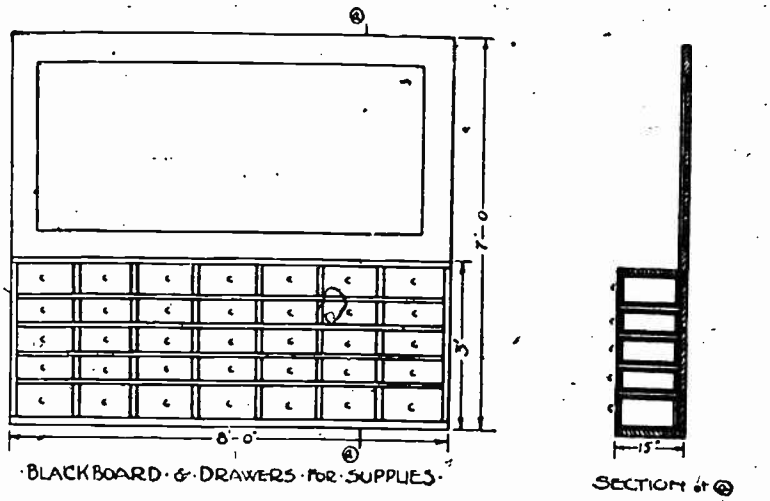

FIG. 4.—Elevation of blackboard and drawers for supplies. Racks for drawing boards could be substituted for two rows of drawers. The blackboard should be of slate.

The laboratory contains plenty of drawer space. Cases are mouse proof, so that grains and other edible material may be safely stored.

The side tables are at least 2 feet wide and 30 inches high. There is a drawer for each 2 feet of length. The tops are smooth matched and finished in such a way that they may be protected from damage and kept clean and smooth.

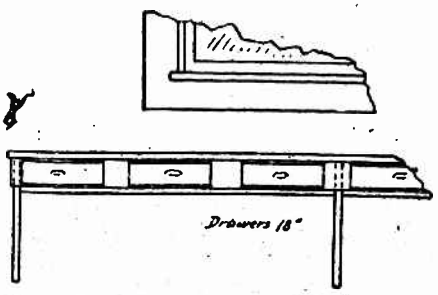

FIG. 5.—Elevation of laboratory tables. To insure good lighting, curtains should roll from the bottom of the windows rather than from the top.

EQUIPMENT.

Agriculture requires a definite, special equipment; and adequate provision for agriculture teaching requires an expenditure greater than for any of the other sciences. Outdoor as well as indoor work must be considered. Some of the materials and apparatus used in the physical, chemical, or biological laboratories may also be used by the teacher of agriculture, but in no case is such equipment alone sufficient. A list of the kinds and amount of materials needed is made out at least once a year by the teacher of agriculture.

The board of education sees that funds for such material are provided without delay. Laboratory supplies for the year are, so far as possible, secured before the opening of the school in the fall. In compiling a list of the equipment and material needed, the teacher goes over his outlines of work for the coming year and carefully notes his probable needs. Local material is collected by the teacher and pupils, and some of the apparatus is constructed in the school.

The following is a suggested list which represents the average equipment in the New York schools. Many of the articles listed are made in the shop, some are collected locally, and others donated by commercial firms.

FIRST-YEAR AGRICULTURE—POULTRY HUSBANDRY.

- Incubator (50–450 egg). 1.
- Killing knives (Krum). 3.
- Chart material (sign painter's cloth), 20 yards.
- Stamping outfit, 1 set.
- Score cards.
- Poultry feeds. 1 set.
- Egg tester.
- Exhibition coops.
- Picking box. 1.
- Poultry-carrying crates.
- Parcel-post carriers.
- Egg preservatives.
- Disinfectants.

SECOND-YEAR AGRICULTURE—FARM CROPS, SOILS, AND FERTILIZERS.

- Vials, 4 dozen.
- Hand lenses, 10.
- Tape measures. 10.
- Dry measures, 1 set.
- Passe partout tape. 5 pieces
- Spades, 2.
- Soil auger, 1.
- One-quart bottles, 10.
- One-quart fruit jars. 2 dozen.
- One-pint fruit jars, 1 dozen.
- Soil cans. 1 dozen.
- Flower pots (6-inch). 2 dozen.
- Celluloid sheet (24 by 36 inches), 1.
- Ignition crucibles, 2.
- Small shallow pans, 24.
- Gas chimneys, 3 dozen.
- Glass tumblers, 3 dozen
- Funnels (3-inch). 6.
- Soil sieve (coarse), 1.
- Scales. 1 pair.
- Paraffin (cakes). 2.
- Cheesecloth. 5 yards.
- Sieves (20, 40, and 60 mesh). 3.
- Grains:
  - Thrashed.
  - Sheaf.
- Grasses and legumes:
  - Plants.
  - Seeds.
- Plant disease specimens.
- Insects (preserved or mounted).
- Spraying materials.
- Treating materials.
- Balances.
- Flower pots.
- Germinating trays. 10.
- Glass plates (convenient size).
- Corn rack. 1.
- Fruit jars.
- Soil boxes (1 by 1 by 1 foot). 3.
- Capillary support racks. 2.
- Support racks, 6.
- Soil bins.
- Chemicals (in small quantities):
  - Sodium carbonate.
  - Calcium sulphate.
  - Potassium permanganate.
  - Ammonium hydrate.
  - Sulphuric acid.
  - Calcium oxide.
  - Muriate of potash.
  - Litmus paper.
  - Ammonium hydrate.
  - Calcium carbonate.
  - Hydrochloric acid.
  - Sodium chloride.

THIRD-YEAR AGRICULTURE—FRUIT GROWING, ANIMAL HUSBANDRY, AND DAIRYING.

- Babcock milk tester (12-bottle). 1.
- Babcock milk tester (4-bottle, open), 1.
- Milk test bottles, 18.
- Cream test bottles (9-gram), 6.
- Skim milk test bottles, 6.
- Acid measures (17.6 c. c.), 12.
- Test bottle brushes, 12.
- Hydrometer jars (12 by 2 inches), 2.
- Lactometer (Quevenne), 1.
- Lactometer (B. of H.), 1.
- Graduate (8-ounce), 1.
- Pipettes, 12.
- Glass and rubber tubing.
- Cream scales, 1.
- Composite sample jars (screw top) 1 dozen.
- Burettes (50 c. c.), 2.
- Score cards (selected), 200.
- Sediment tube and bushing, 1.
- Dairy thermometer, 1.
- Burette holders, 2.
- Milk test bottle holders, 10.
- Measuring standard, 1.
- Samples of animal feeds.
- Chemicals (small quantities):
  - Iron chloride.
  - Starch—potassium iodide.
  - Hydrogen peroxide.
  - Farrington's alkali tablets.
  - Bichloride tablets.
  - Silver nitrate, C. P.
  - Potassium chromate.
  - Sulphuric acid (18 pounds).
- Hydrometer, 1.
- Spray pump, 1.
- Budding knives, 6.
- Grafting chisel, 1.
- Pruning saws, 4.
- Pruning shears, 1.
- Raffia, 1 pound,
- Beeswax, tallow, resin.
- Agate basins, with handle (3-quart). 12.
- Pails (12-quart), 2.
- Twine, 2 balls.
- Measuring tape (50 feet), 1.
- Vials, 4 dozen.
- Insect and pathology mounts.
- Spray nozzles.
- Chemicals:
  - Copper sulphate, 18 pounds.
  - Flowers of sulphur, 10 pounds.
  - Lump lime, 10 pounds.
  - Arsenate of lead, 5 pounds.
  - Insecticides, fungicides.

FOURTH—YEAR AGRICULTURE—FARM MANAGEMENT AND FARM MACHINERY

- Farm level and outfit, 1.
- Cement tools, 1 set.
- Farm score cards.
- Place tables, 3.
- Farm machines.

REQUIREMENTS FOR STATE AID.

1. That the time of teachers shall be devoted exclusively to vocational work. This precludes the supervision of a general study hall and the teaching of other than vocational pupils.

2. That the school shall have at least 15 enrolled pupils. Pupils registered in the school and carrying on a project in conformity with the rules and regulations governing project work may be counted in the required 15.

3. That such school shall maintain an organization and course of study and shall be conducted in a manner approved by the commissioner of education through the division of agriculture and industrial education.

4. That the teacher of agriculture shall be employed for service during the summer months. It is necessary for the board of education or trustees to determine the educational services to be rendered by this teacher during the time the school is not open (the summer vacation). This plan is submitted to the division of agricultural and industrial education. If the plan is approved and the work is satisfactorily done, additional apportionment is made. The following suggestions are made to boards of education in planning this work:

(*a*) The year should begin in September rather than in June or July.

(*b*) Plans for the summer work of the teacher and the detailed plans of the pupils' home project work must be submitted to the division of agricultural and industrial education before April 1.

(*c*) Arrangements are made concerning transportation for the teacher during the spring, summer, and fall. It is definitely understood whether he or the board is to provide means of transportation.

(*d*) The following are some phases of summer work suggested for the teacher of agriculture: (1) Supervision of home project work carried on by boys who are enrolled in the school, (2) supervision of experiments or projects undertaken by boys or young men not in school but who may be interested (some of these boys may decide to enter school later), (3) collecting material for classroom and laboratory use the following year, (4) locating objective points and making arrangements for field trips to be taken the following year, (5) assisting local farmers to solve some of their troublesome problems when these farmers request such aid.

Duplicate plans for home project work are made, one to be kept on file in the school records and extended as the work progresses, the other to be sent to the division of agricultural and industrial education. Blanks for recording this work are furnished by the division.

USE OF LAND.

The school may use a small plat of ground to advantage, but it is not necessary for it to have a farm. The teacher and pupils make

use of the near-by farms and their equipment for much of the laboratory instruction. Pupils make use of their home farms in the required project work.

ARRANGEMENT FOR PROJECT WORK.

When the school is closed and formal instruction ceases, it is expected that the teacher will devote his time to making effective this home instruction. By this means not only do the boys have an opportunity to make their home work effective, but also that the teacher may get a thorough knowledge of the business conditions of the community and make it reflect itself in the instruction in school during the following years.

Furthermore, before a pupil is registered in agriculture, there is a definite understanding with the parents concerning opportunity to do project work. Some days during the planting season it means absence from other classes to get the project properly under way. Formal class work in agriculture subjects is gradually replaced by individual work on the projects.

The explanation on the following pages will make clear the relation of the project to the class instruction.

RELATION OF THE PROJECT TO THE CLASS INSTRUCTION.

1. *Vocational subjects.*—A department of agriculture is established in a high school with the assumption that nearly all pupils enrolling in the agricultural course have had some farm experience. It is further assumed that each pupil has definitely decided upon farming as his vocation. These facts are considered in determining the method of instruction. Previous and current farm experience supplemented by laboratory (including field) experience is the basis of the vocational work. During all the first and part of the second term of each year the time allotted in the schedule to vocational subjects is used to give the pupils a good general knowledge of the particular subjects studied. This instruction includes the best-known practices and the science underlying them. Regular text-book assignments or readings form a part of this work, but are always related to the laboratory, field, or farm experiences of the pupils. This general study of the subject is continued until about March 1, when the amount of time given to it varies inversely with the amount given to project work.

2. *Project work.*—At the beginning of each school year the teacher of agriculture calls the attention of pupils in his classes to the fact that before March 1 each one is expected to have selected some project or problem along the line of one of the vocational subjects which he is to study that year. (Usually a pupil's first or second year project does not begin until April or May, but third and fourth year

projects begin in the fall.) After March 1 a part or all of the time set aside for laboratory and possibly some of the recitation time is devoted to projects. Part of the time is spent in school reading references, drawing plans, constructing appliances, testing soil, or whatever else may be necessary in connection with a particular project. Some of the time is used at home properly to start and carry on the project. This work is essentially individual, and therefore requires much time and patience on the part of both parent and teacher.

In extreme cases when the pupil is unable to carry on a project at home, because of distance or lack of room, arrangements are made by the school authorities, or others interested, for him to carry on the work elsewhere.

City or village pupils may substitute a certain amount of supervised farm work of a general nature for a first project.

3. *Nontechnical studies.*—Vocational pupils have not more than seven-twelfths of their work along nontechnical lines; that is, history, English, mathematics, and science. Vocational teachers in departments of agriculture in high schools do not teach agricultural biology, agricultural chemistry, and agricultural physics as separate subjects, but include the elements of such instruction as a part of the agricultural subjects in which any particular element naturally appears. Thus a pupil's first instruction in chemistry may be in a class in soils and fertilizers. Biology, physics, and chemistry are then classed as nontechnical studies; and vocational pupils, together with pupils from other departments, study these subjects in classes taught by nonvocational teachers.

4. *Professional improvement for the instructor.*—When the teacher of agriculture is employed for the summer work, he is retained for the spring vacation, in case it occurs at the time when projects may be started. When the teacher is so retained, there is little time left for him in which to keep in touch with higher institutions. It is recommended by the State department of education that the teacher of agriculture be given a vacation extending from the beginning of the Christmas recess to the beginning of the second term of school, or the close of the January regents examinations. A part of this time is usually spent by him in study. The vocational pupils during this period devote their time to the nontechnical subjects.

SUMMER MEETING AT STATE COLLEGE OF AGRICULTURE.

Each summer the teachers of vocational agriculture are called together for a week at the State College of Agriculture for the purpose of considering matters of professional interest. The members of the staff of the college have been most helpful at these conferences, explaining to the teachers what the various departments of the college

are emphasizing, giving assistance in the solution of individual problems and assisting as members of working committees. The college also furnishes each year a prominent speaker from outside the State. The meetings are given over to a consideration of the problems which are of vital interest to all the teachers. This conference really passes upon all new plans before they are put into operation in the State. Two of the most important problems considered are (1) the sifting out of a body of subject matter suited to the high school, and (2) the development of a method of teaching suited to the high school.

MONTHLY REPORT SHEET.

Each teacher submits a monthly report which indicates the work done daily. These reports are carefully analyzed and the composite presented at the summer meeting of the teachers. This is an attempt to work out by actual practice the following problems:

1. A reasonable and workable seasonal sequence of subject matter.
2. The relative amount of time to be given to the various topics.
3. The relative amount of time to be spent in recitation, laboratory, field, and demonstration activities.
4. The best available references and laboratory directions.

These reports also furnish a valuable addition to the information gained by inspection of the schools.

SUMMER WORK OF TEACHERS OF AGRICULTURE.[1]

These statements are submitted in duplicate. When approved one copy is kept on file in the division of agricultural and industrial education and the other returned for the school files. This report is due each year on April 1. Unsatisfactory projects are adjusted by mail or extra visits to the school. The purpose of this report is to insure a satisfactory project for each pupil.

The project accounts are kept on file in the school and are subject to call from the State department of education. Inspection of a school includes a scrutiny of these records. The blanks are furnished by the State department.

The summary of accounts of the projects in a school is submitted to the State department of education in duplicate. When approved, one copy is retained for the files of the central office and the other returned for the school files. This report is due each year on June 1 following the summer in which the project was carried on. This allows time for carrying projects a full year, even though started as late as March 1.

Since regents' credit is given for this work, including projects, all claims for credit are checked up with the project reports before credit is given.

[1] Preliminary statement of home projects.

INSPECTION OF SCHOOLS.

The division of agricultural and industrial education of the State department is charged with the general supervision of vocational instruction and with the duty of gathering and making known all obtainable helpful information upon the subject. To a specialist in agricultural education and one assistant is assigned the agricultural part of this work. Each vocational department is visited at least twice each year, once when the school is in session and once when the project work is under way. Some of the schools are visited four or five times during the year. The purpose of these visits is twofold: (1) To assist in improving the work of the department; (2) to inspect the school and "check up." The following cards and the explanations accompanying them indicate the nature of the inspections and records of the same.

The visitation card is used for the field record. A single card is sufficient for several visits, since not all lines of work may be seen on each occasion. In any case the visitation cards need to be with the field worker in order that he may follow up the suggestions made on previous visits. These cards are kept on file at the State office so that the field worker may select the cards needed when starting out on a trip.

The school record card is kept in the office files as a permanent record and as a cumulative summary of the information found on the visitation cards. Each of these cards is intended to give a bird's-eye view of the conditions existing in a school.

Under the heading "Subject" is merely indicated the year or years of agriculture being taught, since the subjects are all included under first, second, third, and fourth year agriculture. The "enrollment" in each subject is merely indicated numerically.

The school records which should be on file in the school are the Roll Book, the Class Book, containing a record of the daily work and examinations, the Daily Plan, which is a duplicate copy of the monthly reports sent in to the department, and an Inventory of all books and apparatus.

The department records consist of a duplicate copy of the preliminary statement of projects, a duplicate copy of the final statement of projects, the regent's credit records, which are duplicate copies of the claims for credit sent in to the State department, the cards of study assigned to the individual pupils who are enrolled in agriculture, and a diary account of the summer activities of the teacher of agriculture.

The projects plans consist of the outline of plan for each individual project and each class project. The class project is more in the nature of an extended series of laboratory exercises.

The projects account consists of a report and cash record and the summary and financial statement of each individual project.

The projects summaries are the "write-ups" by pupils and consist of such information as is not contained in the plan of procedure of the financial records. Mistakes and successes are here recorded, conditions beyond the control of the people, such as weather, floods, etc., the conclusions and information gained. The indication on the visitation record is merely whether or not various records are complete and approved.

Books.—The following points are taken in consideration in approving the books: Number, selection, where kept, how catalogued or arranged, how used and how much used.

Equipment.—Amount, selection, arrangement and care.

Bulletins.—Number, selection, where kept, how catalogued, how used, and how much used.

Texts.—Title and author, and in case of an unusual or new book also the publisher.

SCORE CARD.

Preparation.	*Method.*	*Results.*
Recitation.—The assignment of the lesson. Is it clear and definite? What explanation of the work to come is given? Is the teacher familiar with the subject matter of the text? What reference is made to the relation of regular conditions to the assignment? What reference is made to previous laboratory or field work as related to the assignment?	Oral or written, lecture, question and answer or topical? Is there sufficient fixation? Is the recitation combined with administration? Taken as a whole, is it snappy or dull?	Are they definite? Is the apparent aim accomplished? Is the day's work definitely related to work which has preceded and that which is to follow? Has it been worth while so far as the application to the project is concerned?
Laboratory.—Are outlines or oral directions given? Were directions written on the blackboard? Were the materials ready? Did both the teacher and pupils know what to do and how to do it? Was oral explanation given during the progress of the work?	Was it individual work or group work? Did it precede or follow the recitation? Was it inductive or deductive?	Was there a notebook write-up? Was reference made to use of this work in recitation? Was it related to a general topic of the week or month? Was it seasonal?
Field.—Was the plan definite? Was the place definite and accessible? Had there been any previous discussion of the field work? Were definite instructions given and how were they given? Was the teacher	Was the trip conducted in an aimless, careless way or in a methodical orderly way? Were there explanations by the teacher and by others? Were the pupils questioned or asked to discuss what was seen? Was	Were the reports comprehensive, definite, and concise? Were they in good form?

SCORE CARD—Continued.

Preparation.	*Method.*	*Results.*
familiar with the place visited? What directions were given concerning a report of results?	attention called to particular points not mentioned in the outline?	
Notebooks.—Is there a definite understanding of what is to be included and the form to be followed?	Is it descriptive, illustrative, or outline in form? Are the notes to be written up in class or in the field in permanent form or are they to be copied?	What is the form and content of the material? Is it so organized that it is available? Is it useful? Is use made of it?
Summer.—Does the teacher make note during the year of things to be done in the summer? Has he a list of materials to be collected? Has he a list of boys to be visited?	Does he visit his projects at stated intervals, or does he keep closely in touch with them to know when there is need of a visit? Does he keep a daily diary of what he accomplishes? Does he have rainy-day jobs, such as preparation of outlines for the coming year?	Are his projects satisfactory? Does he know the community? Does the community know him?

Extension.—There is no attempt to follow the "preparation," "method," and "result" outline. It is generally understood that the main feature of the extension work is the supervision of the junior projects. A summary of extension activities is suggested, as follows: Senior home projects—meetings held, meetings addressed; materials and specimens collected. Junior home projects—meetings attended; materials prepared for newspapers and magazines; charts made.

Suggestions.—List any of the points of the foregoing where the teacher is weak; need of additional equipment or books, or any suggested changes in administrative procedure.

Results.—The extent to which the suggestions have been carried out to be recorded on successive visits.

PENNSYLVANIA.[1]

LEGISLATION.

The Pennsylvania Legislature of 1913 enacted a vocational education law which provides aid for three types of vocational schools or departments, as follows: (1) The day school or department, (2) the evening class, and (3) the part-time or continuation class. The law provides that a vocational school shall mean a distinctive organization of teachers, courses, and pupils approved by the State board of education. There are two ways in which all the day vocational

[1] The author is under obligation to Mr. L. H. Dennis, of the State department of public instruction, for valuable assistance.

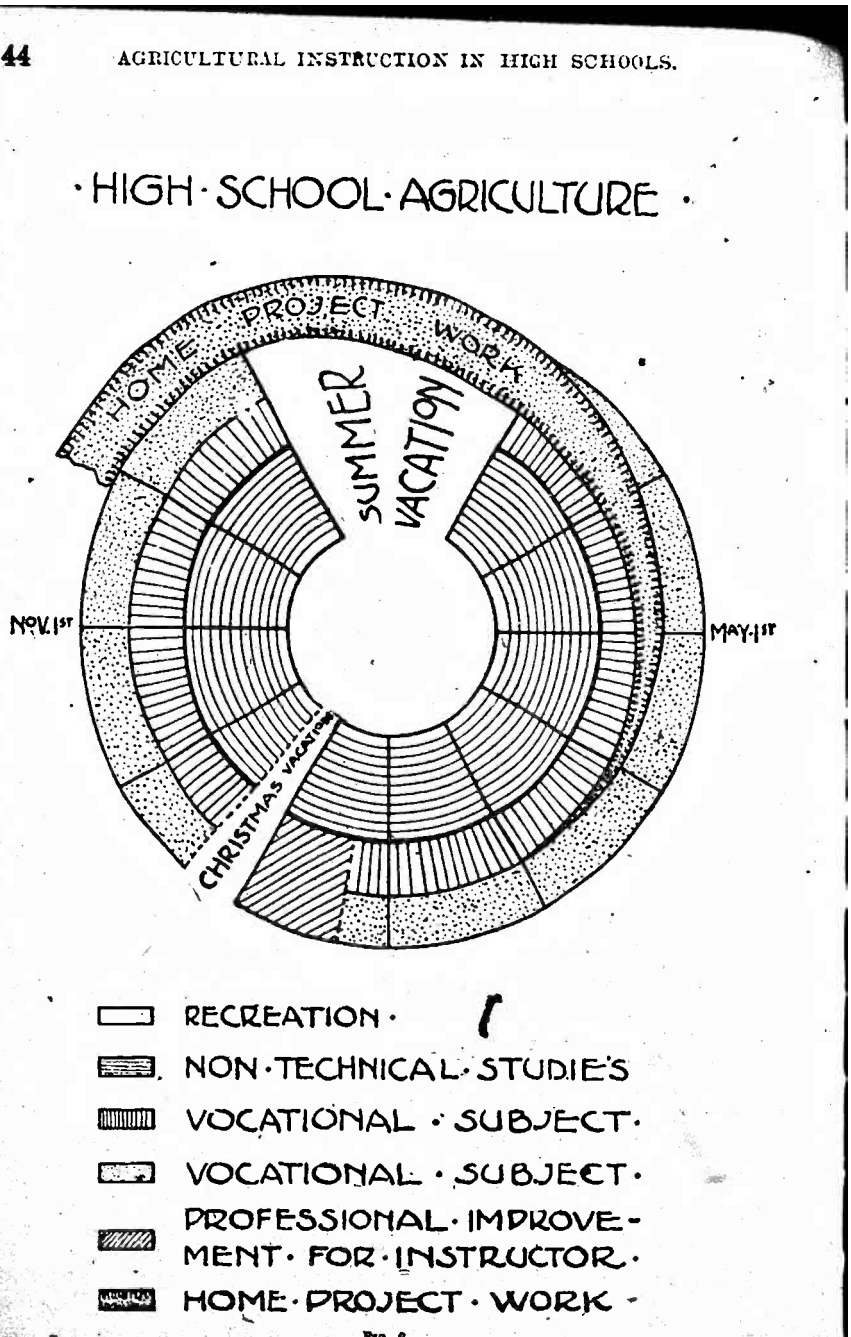
HIGH SCHOOL AGRICULTURE
HOME PROJECT WORK
SUMMER VACATION
NOV. 1ST
MAY 1ST
CHRISTMAS VACATION
RECREATION
NON-TECHNICAL STUDIES
VOCATIONAL SUBJECT
VOCATIONAL SUBJECT
PROFESSIONAL IMPROVEMENT FOR INSTRUCTOR
HOME PROJECT WORK

FIG. 6.

schools may be organized, either as a separate school or as a department of another school. An "evening class" in an agricultural school or department shall mean a class giving such training as can be taken by persons already employed during the working-day, and which, in order to be called vocational, must in its instruction deal with the subject matter of, and be so carried on as to relate to, the day employment. A "part-time or continuation class" in an approved agricultural school or department shall mean a vocational class for persons giving a part of their working time to profitable employment, and receiving in the part-time school or department instruction complementary to the practical work carried on in such employment. To give "a part of their working time" such persons must give part of each day, week, or longer period, to such part-time class during the period in which it is in session.

In 1916–17 there were 17 vocational schools and 18 vocational departments in public high schools.

Two types of schools in operation under this law are the vocational department in the public high school and a vocational school. Some of the common features of the two types of vocational agricultural instruction are as follows: (1) The course in agriculture is the same for each type. (2) All teachers in a vocational school receive State aid to the extent of two-thirds of the salary of each teacher, the other one-third being paid by the township. (3) In vocational departments in high schools the State pays two-thirds of the salaries of the vocational teachers. It also reimburses outside districts one-half the amount paid for tuition of pupils attending vocational schools or departments. (4) The supervisor of agriculture is employed for 12 months of the year and devotes his entire time to the teaching of agricultural subjects.

In vocational schools agriculture for the boys and home economics for the girls is required for the first and second years. At the beginning of the third year the pupil has the option of continuing the vocational work and graduating in that department, or of changing the course and taking purely academic work for the last two years. English is required every year with all courses. In vocational departments pupils are required to pursue the four years' work in agriculture without change.

QUALIFICATIONS OF TEACHERS.

The State board of education through the bureau of vocational education of the department of public instruction sets the following standards for vocational teachers of agriculture: (1) A teacher of agriculture should have the equivalent of a high-school education; (2) he should be a graduate of an approved agricultural college, or in lieu thereof should have at least two years of training in a higher institution of learning, supplemented with at least four short terms or an equivalent in approved agricultural courses of study; (3) he

must have had sufficient practical farm experience to make him familiar with farming methods (this experience is intended to put him in sympathy with rural life and to make him appreciative of its problems); (4) he should have had a general well-rounded knowledge of agriculture as preferred to one who is a specialist in a limited field; (5) he should have had some experience in teaching in the public schools previous to his entering upon this work; and (6) he must show ability to make and use working drawings and also have a knowledge of the use of tools and the use of the forge.

SUMMER MEETING AT STATE COLLEGE OF AGRICULTURE.

Each summer the teachers of vocational agriculture are called together at the State College of Agriculture for the purpose of considering matters of professional interest. This annual meeting has in it much merit, and is followed not only in Pennsylvania but in New York and Massachusetts. The members of the staff of the agricultural college explain to the teachers what the various departments of the college are emphasizing, give assistance in the solution of individual problems, and assist as members of working committees. The college also furnishes each year a prominent speaker from outside the State. The following is the program of the meeting held July 18–28, 1916:

TUESDAY, JULY 18, 1916.

10.30 a. m. Room 7.—Horticultural Building. Getting acquainted.
11.00 a. m. Announcements. Assignments to sections. Arrangements for extra work.

2.00–4.30 p. m.
Forging—Room 114, Engineering Building, P. R. Hall.
Wood Shop—Room 207, Engineering Building, G. R. Resides.

WEDNESDAY, JULY 19, 1916.

8.30–10.30 a. m. General session
Room 7, Horticultural Building. The Course of Study, James S. Champion.

10.30 a. m.–12.10 p. m.
Forestry (outline)—Forestry Building, G. R. Green.
Dairying (Dairy lab.)—Room 57, Dairy Building, A. L. Beam.
Relation to the Rural Schools—Room 7, Horticultural Building. Principals and Directors. E. R. Gehr.

2.30–4.30 p. m.
Forging—Room 114, Engineering Building, P. R. Hall.
Wood Shop—Room 207, Engineering Building, G. H. Resides.

THURSDAY, JULY 20, 1916.

8.30–10.30 a. m. General session.
Room 7, Horticultural Building.
The Community School of the Future, L. R. Appleman.
Summer Transportation, W. S. Barnhart.
Weekly Reports and Summaries, John G. Wilson.
Report of banquet committee.

10.30 a. m.–12.10 p. m.
Forestry (Lab. demonstration)—Forestry Building, R. A. Chaffee.
Dairying (Dairy lab.)—Room 57, Dairy Building, A. L. Beam.
The Six and Six Plan—Room 7, Horticultural Building, Principals and Directors. E. R. Loose.

2.30–4.30 p. m.
Forging—Room 114, Engineering Building, P. R. Hall.
Wood Shop—Room 207, Engineering Building, G. H. Resides.

FRIDAY, JULY 21, 1916.

8.30–10.30 a. m. General session.
Room 7, Horticultural Building.
Community Service, Discussion.
Farmers' Night Schools, L. R. Guillaume.
Special Meetings, Edgar F. Byers.
Short Courses, W. W. Reitz.
Reaching the People, H. G. Parkinson.

10.30 a. m.–12.10 p. m.
Poultry Raising (incubation)—Stock pavilion, F. D. Crooks.
Dairying (creamery lab.)—Room 57, Dairy Building, A. L. Beam.
Administrative Problems—Room 7, Horticultural Building, Principals and directors. Kimber A. Hartman.

2.30–4.30 p. m.
Forging—Room 114, Engineering Building, P. R. Hall.
Wood Shop—Room 207, Engineering Building, G. H. Resides.

MONDAY, JULY 24, 1916.

8.30–10.30 a. m. General session.
Room 7, Horticultural Building. Home and Group projects:
What is a Project? W. L. Treager.
Projects for Town Boys, B. A. Rockwell.
Project Records, E. P. Vogel.

10.30 a. m.–12.10 p. m.
Farm Bookkeeping—Room 205, Agricultural Building, W. R. Gorham.
Poultry House Construction—Stock pavilion, F. D. Crooks.

2.00–4.30 p. m.
Killing and Dressing Chickens—Stock pavilion, F. D. Crooks.
Spray Materials—Implement shed, W. C. Gillespie.

TUESDAY, JULY 25, 1916.

8.30–10.30 a. m. General session.
Room 7, Horticultural Building.
Report of committee on equipment.
Questions and general discussion.
Address, Dean R. L. Watts.
The Pedagogy of Agriculture, Prof. Thos I. Mairs.

10.30 a. m.–12.10 p. m.
Trip to Experimental orchard, Dr. Stewart.

2.00–4.30 p. m.
Caponizing—Stock pavilion, F. D. Crooks.
Farm Mechanics—Farm mechanics laboratory, R. A. Andree.

WEDNESDAY, JULY 26, 1916.

8.30–10.30 a. m. General session.
Room 206, Agricultural Building.
Address, Dr. E. E. Sparks, President Pennsylvania State College.
Address, Dr. N. C. Schaeffer, State superintendent of public instruction.
Address, Dr. J. George Becht, secretary State board of education.
Brief addresses, members of the State board of education.

10.30 a. m.–12.10 p. m.
Vegetable Gardening—Room 105, Horticultural Building, M. G. Kains.
Farm Management—Room 103, Agricultural Building, W. R. Gorham.

2.00–4.30 p. m. Individual assignments.

THURSDAY, JULY 27, 1916.

8.30–10.30 a. m. General session.
Room 7, Horticultural Building.
Publicity, R. C. Wiggins.
Club work, Clark W. Clemmer.

10.30 a. m.–12.10 p. m.
Stock Judging—Stock pavilion, W. H. Tomhave.
Landscape Gardening—Room 200, Horticultural Building, A. W. Cowell.

2.00–4.30 p. m. Fertilizers and Fertilizer Plots, C. F. Noll.

FRIDAY, JULY 28, 1916.

8.30–10.30 a. m. General session.
Room 7, Horticultural Building. How is Vocational Agricultural Instruction Affecting the Rural Districts Economically? John W. Warner.

TYPES OF VOCATIONAL SCHOOLS.

The vocational school, as indicated above, is coming to be the most popular form of vocational agricultural instruction in the State. Probably the Honey Brook Vocational School, maintained by the borough and township of Honey Brook, cooperating with the State of Pennsylvania, opened October 2, 1916, offers as good an example of this type of school as can be found in the State. Any boy or girl who has completed the work of the eighth grade in any township or borough not maintaining a vocational school is eligible to attend the school free of charge. A tuition fee, however, is charged the district sending students not residents of Honey Brook township or borough.

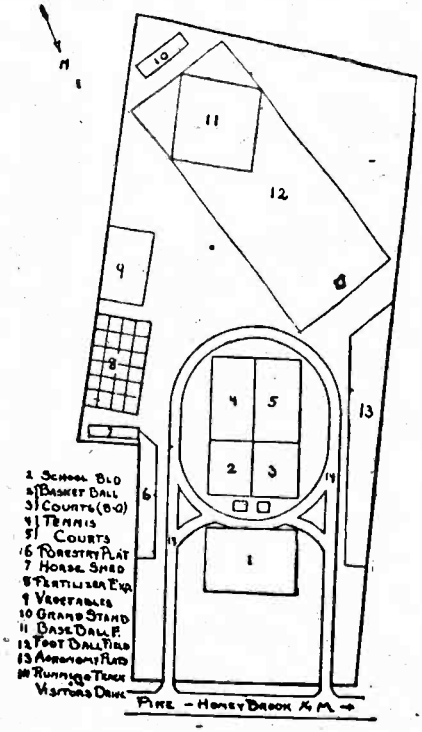

FIG. 7.—Honey Brook Vocational School.

Special provision is made in this school, as well as in schools of this type throughout the State, for the admission of pupils over 14 years of age who desire vocational training and who have not completed the work of the eighth year of the graded schools.

Pupils having completed three years of work in local high schools may attend one year and receive a first-class high-school certificate.

CURRICULA OF VOCATIONAL SCHOOLS AND DEPARTMENTS.

Climatic, soil, and economic conditions in the various sections of the State vary enough to affect the types of farming carried on; hence, a course of study in agriculture adapted to one section might not be suitable in every respect to another section. The fundamental principles underlying this vocational course will prevail in every district, but local community interests determine many of the details. The schools and departments follow, in general, the course of study as outlined in Bulletin 2 of the State department of public instruction, Agricultural Schools and Departments. All courses of study must be approved by the department of public instruction.

COURSE OF STUDY IN MOUNT PLEASANT TOWNSHIP VOCATIONAL SCHOOL.

FIRST YEAR.

Required.	*Elective.*
English.	Ancient history.
(One other academic study).	Latin.
Boys—Poultry.	Algebra.
General science.	
Mechanical drawing.	
Shop.	
Soils.	
Vegetable gardening.	
Home project.	

SECOND YEAR.

English.	Geometry.
(One other academic study).	Latin.
Boys—Farm crops.	History.
Forestry.	
Shop.	
Bookkeeping.	
Ornamental gardening.	
Home project.	

THIRD YEAR.

English.	Algebra.
(One other academic study).	Chemistry.
Boys—Fruit.	History.
Dairying.	Latin.
Animal husbandry.	German.
Home project.	

FOURTH YEAR.

English.	Geometry.
(One other academic study).	Arithmetic.
Boys—Farm mechanics.	Physics.
Shop.	German.
Rural law.	Latin.
Farm management.	History.
Fertilizers.	Civics.

A course of study extending through four years is offered in these vocational schools and departments, which, as a course, is elective to boys when they enter the school. Individual subjects in the course of study are not elective. One-half of the agricultural work must consist of actual practice in the field, laboratory, or shop. Two hours of such practical work make up one hour as given on the schedule, and the practicum periods are all double periods. It will be noticed that two academic subjects are required, together with the agricultural work. One of these must be English and the

other may be optional so far as it can be arranged for on the academic schedule. Experience shows that in some schools the brighter boys are able to carry three academic subjects without any trouble. When this is done some principals recommend that the third study be a foreign language. In that case, the work covered in this course is sufficient to meet the entrance requirements of most colleges.

Generally in the first and second years the academic work is given in the forenoon and the agricultural work in the afternoon. In the third and fourth years the agricultural work is given in the forenoon and the academic work in the afternoon. For administrative purposes the first and second year pupils are in one section in the agricultural work and the third and fourth year pupils in another. The nature of the agricultural work is such that it makes very little difference whether the first or second year's work as scheduled above comes first. The same is true of the third and fourth years. This arrangement makes it possible for one teacher to handle the agricultural work for the entire four classes, having one section in the forenoon and the other in the afternoon. When the classes become too large to be thrown together in this way, an assistant is provided.

The amount of practical training will be shown more clearly by the sample daily program in agriculture given below. The practicum periods are marked by a (*) star.

SAMPLE PROGRAM.

Afternoon.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.
1.15–1.55	.....	Poultry.....	.....	Poultry.....	Soils.
1.55–2.35	Soils.....	Forestry....	Soils.....	*Soils.....	*Shop.
2.40–3.15	*Poultry raising...	*Soils.....	*Forestry...	*Soils.....	*Shop.
3.15–4.00	*Poultry raising...	*Soils.....	*Forestry...	*Shop.....	.....

Many trips are taken to the farms of the community for instruction in practical work. The instruction in the woodworking shop is correlated as far as possible with instruction given in the various agricultural subjects. In connection with the study of poultry raising the boys built trap nests, feed hoppers, hovers, brooders, and colony houses. Hotbeds and cold frames are made by the class in vegetable gardening.

TOWANDA HIGH SCHOOL.

The following is a description of the first year's work at the Towanda High School, exclusive of home project work, which is more or less typical of the work covered in all the vocational agricultural instruction.

Poultry raising.—The course in poultry raising consists of lectures and recitations on the egg, its construction, composition, fertilization, incubation, and brooding; poultry feeds and feeding; poultry-house construction; insect pests and parasites; and common poultry diseases. The laboratory work is an essential part of the course. In the laboratory a careful study is made of different breeds; methods of preparing poultry for market, such as killing, picking, cooling, packing, etc.; caponizing and judging.

Soils.—Soil management, which is fundamental in agriculture, is taught in the first year. The soils laboratory has a very complete equipment for a high school. Soils apparatus of all kinds has been purchased. The soils equipment has cost in round numbers $225. Many field trips are connected with the study of soils.

Farm forestry.—The course in farm forestry is arranged to teach the principles of forestry as applied to the care and formation of the wood lot; relation of forestry to agriculture; wind breaks; forest plantations; collection, storage, and planting of tree seed; estimation of board feet and cord wood; methods of preventing decay of fence-posts and shingles. Careful study is made of the various trees in reference to their adaptation and use. The practicum work consists of field excursions and laboratory exercises. This includes a careful study of the habits of growth; the identification of trees by leaf, bud, twig, and bark; estimating timber, methods of thinning; natural and artificial reproduction.

Shopwork.—The course in shopwork aims to teach the correct use of common wood-working tools. A complete set of carpenter's tools is placed at the disposal of each individual in the class. Proper methods of their use and care are demonstrated. The student is taught to make many articles, such as saw horses, feed hoppers, chicken coops, swinging stanchions, doubletrees, whiffletrees, step-ladders, etc., all of which are useful on the farm.

Before taking up the woodwork, the student is taken to the drawing-room, where the work is completely outlined and a detailed drawing made of the proposed design. Furthermore, the student is not only taught to make pencil sketches and drawings, but is given an opportunity to press and blueprint his work. This gives a student a thorough drill in the drawing-room in drawing-room standards and practices. A completely equipped drawing-room has been prepared for the above work. Another phase of the shopwork is the forge room. Three forges and three anvils have been installed. In this room the boys will learn the fundamental principles of iron-work and will make such articles as coal chutes, chain links and rings, chain hooks, whiffletree hooks, clevices and bolts, hay forks, chisels, etc.

In the laboratory pupils are given direction sheets, similar to the following, outlining work to be prepared, with the request that

each exercise be written up under the headings of object, material, method, results, and conclusions:

DIRECTION SHEETS.

EXERCISE 1.—A study of some of the common weeds and their seeds.

Reported by..... Date.....
Family of plant..... Genus and species.....
Common name or names.....
The plant. Some characteristics as to size, annual or perennial, habit of growth, special soil or other requirements, season of maturity, etc.
Best means of eradicating.....
The seed. Its color, shape, characteristic markings, abundance, special manner of distribution, etc.....
Size compared with seed in which usually found and how best removed.....
References. Bulletins:

Ohio 142, 175.	Farm Weeds: Ottawa, Canada.	Kentucky 124.
Kansas 56, 57, 141.		Michigan 260.
Nevada 38, 47.	Manual of Botany: Gray.	B. P. I. 84.
Iowa 88.		Farmers' 428.

Make drawings of the seed natural size and then enlarged so as to show characters useful for identification. Sketch the plant or plant parts which may point out distinctive features.

EXERCISE 2.—Oats.

Name..... Laboratory section..... Date.....
(Label all parts of each drawing.)

1. Make a drawing of an open panicle of oats showing—(*a*) Rachis. (*b*) Branches. (*c*) Pedicel.
2. Make a drawing of a single spikelet showing—(*a*) Outer glume. (*b*) Two oat grains. (*c*) Awn (if present). (*d*) Sterile flower.
3. Make a drawing of a cross section of a single oat grain showing—(*a*) Flowering glume. (*b*) Palea. (*c*) Kernel.
4. Make a drawing of a longitudinal section of the oat kernel showing—(*a*) Covering. (*b*) Endosperm. (*c*) Germ.
5. What is the difference between a spike and a panicle?
6. How many branches in first whorl? Second?
7. Is there any variation in length of the pedicel?
8. Compare outer glume of oats with the outer glume of wheat.
9. Weight of 25 upper grains..... 25 lower grains.....
10. Remove the kernels from the hull of 25 grains and determine the per cent of hull.
11. Compare the flowering glume and palea of oats with the same of wheat.

EXERCISE 3.—Leguminous forage plants.

Name..... Laboratory section..... Date.....
(Underscore character applying.)

1. Leaves. Spirally arranged, opposite; abundant, medium, not abundant.
   Leaflets: Number....., palmate, pinnate; smooth, hairy, edges smooth, serrated.
   Stipules: Attached to petioles, not attached to petioles.
2. Stems. Height.....Diameter 1 inch from base....., erect, stand decumbent, trailing.
   Stems: Round, square, angular; hairy, smooth, stoloniferous, not stoloniferous.
   Branches: None, few, many.

3. Inflorescence. Raceme, umbel, capitulum. At end of leaf bearing stem or branch, or springing from the axil of leaf.
4. Flowers. Calyx, number of teeth..... Relative length of inferior tooth....., calyx tube, hairy, smooth, number of ribs.
5. Pods. Roundish, kidney shaped, elongated; straight, twisted; opens longitudinally, opens transversely.
6. Seed. Usual number per pod ..... Easily removed from pod, difficult to remove. Reason.....
   Shape: Viewed from largest diameter, round, oval, elliptical, kidney shaped; second largest diameter, round, oval, elliptical, kidney shaped.
   Color: Orange, yellowish brown, dark olive green, black, yellow, reddish red, green, yellowish green.
   Radicle: More than half the edge, less than half the edge; tip of radicle prominent, tip not prominent.
   Hilum: Round, oval, elongated.
7. Sketch leaflets. Sketch pod.

EXERCISE 4.—Structure of the corn plant.

Name..... Laboratory section..... Date.....

1. The staminate flower.
   (a) Make a general drawing of the tassel showing the number and arrangement of the spikes.
   (b) Make a detail drawing of a spikelet showing the outer and inner glumes or bracts, the lodicules, and the number of anthers. Label all parts.
2. The pistillate flowers.
   (a) Make a drawing of a single spikelet of the ear showing the bracts or glumes, the ovary, the style and stigma.
   (b) Examine the silk with the microscope and describe.
3. Draw a portion of a corn stalk bearing a leaf showing: (a) Leaf sheath. (b) Leaf blade. (c) Ligule. (d) Auricle. (e) Rain guard. (f) Mid-rib.
4. Define node and internode.
   Are the internodes the same length throughout the stalk? Why?
   Discuss the fibro-vascular bundles as to their location, structure, and function.
   What is the structure of the pith? Its function?
   Where does growth take place in the corn plant?
5. What is the arrangement of the leaves on the stalk?
   Where does the leaf grow from?
   Discuss the purpose of the leaf sheath, ligule, auricle, and rain guard.
   What gives the wavy effect to the left blade?
   What is the purpose of the mid-rib?
6. What is a staminate flower? A pistillage flower? Locate each on the corn plant.
7. Is corn a self-fertilizing plant? Explain the method of fertilization, tracing the route of the pollen grain.
8. What is a barren stalk?

EXERCISE 5.—Litmus test for soil acidity.

Object—To determine whether a soil is acid or alkaline, and to ascertain the need of lime.

Apparatus—Beakers, red and blue litmus paper, soil, and neutral water.

Manipulation.

1. Place a piece of blue and a piece of red litmus paper in the bottom of each of two small beakers.
2. Cover with a piece of filter paper, wet it with distilled water, and press the paper smoothly over the surface with a glass rod.

Manipulation—Continued.

3. Half fill one beaker with soil and saturate it with water.
4. Let both beakers stand for an hour and examine the litmus papers.
5. Repeat with sandy loam, loam, and much soil.

Questions:

1. Is there any difference in color between the pieces in the beaker with no soil and the pieces in the beaker with soil?
2. What does it indicate?
3. Why use a second beaker containing no soil?

Remarks: It is comparatively easy to test field soil by taking a lump of moist soil and making a ball of it, then with a knife make a slit in the ball and insert the litmus paper.

Caution: Do not allow perspiring or moist fingers to touch the litmus paper.

EXERCISE 6.—To determine the pore space in soils.

Directions: Carefully sieve some air dry clay in an 80 or 100 mesh sieve; do likewise with some sand in a 40 mesh sieve. Weigh 2 Mason jars, recording the weight; to one add 250 grams of the clay which you have prepared and again record the weight. Add the same amount of the prepared sand to the other jar. Then using the graduate add enough water to each to saturate the soil. Whenever the water stands on the top and will not enter the soil then it is saturated. Record your figures in a table like the following:

Results: Kind of soil .....; weight of jar and soil .....; cubic centimeters of water .....; per cent pore space .....; clay .....; sand .....

Carefully write up the experiment in your notebook, after which you will answer the following questions:

1. How much soil is pore space?
2. About what per cent of this pore space should be filled with water in a good soil?
3. Which of the two soils used in this experiment has the larger grains?
4. Explain the answer to the previous question with reference to the results obtained in this experiment.

After having read the directions direct the work for each one; then proceed to do it neatly, promptly, and orderly.

Home projects.—Each boy taking the agricultural course must each year carry on an approved agricultural project. The following is a daily record of an agricultural project:

....
Name of school. Name of student.

....
Title of project. Date.

Record of work done—receipts—expenditures—observations, etc. (give details).	Hours labor.			Dr.	Cr.
	Self.	Others.	Horses.		
Total.....					

Weather observations. (Temperature, wind, fair, cloudy, rain, snow, etc.)

Report inspected by

.....
Supervisor of Agriculture.

This project work is the connecting link between the home and the school in the boy's education. By means of this project work, which is both productive and educational, the boy's training is carried on at home as well as at school. It is this project work, with its close correlation with the work of the classroom, laboratory, and shop that makes the work vocational in its nature, as it thus aims in a very definite way to prepare boys for occupations connected with the tillage of the soil and other activities of the farm. The supervisor of agriculture is employed for the entire year for the specific purpose of supervising these agricultural projects during the summer months in connection with the other community work carried on by him. One boy will take the growing of an acre of corn for his project, another boy grows 3 acres of potatoes. One boy raised 1,500 tomato plants. He purchased two canning outfits with which he canned his products. In addition to canning tomatoes he canned corn, beans, and peas in spare moments. He had his own labels printed and put upon the market his own brand of canned corn, beans, tomatoes, and peas. This he accomplished at the end of his first year in the agricultural course. He learned much during this summer about the value of labor and thrift. He had few idle moments for loafing. He gained some specific knowledge concerning the raising and canning of tomatoes and incidentally cleared for himself $130, after paying for his canning outfits and all expenses in connection with his project.

A careful survey of the farm and home conditions of each pupil is conducted by the teacher of agriculture before the selection of any project by the pupil, and in order that the hearty cooperation of the parent may be secured frequent conferences between the teacher, parent, and pupil precede the selection of the project.

The project work begins in the classroom long before the ground is prepared and the seed sown, as each boy makes a very definite study in advance of the project which he expects to undertake. He also keeps a record of books and authorities consulted, methods to be used, receipts, expenditures, labor, results, etc. This record in itself is of considerable educational value.

The details in carrying out individual and group projects are quite similar to those employed in the home project work of the States of New York and Massachusetts.

Equipment.—The Honey Brook school is under the direction of four specially trained teachers and the work is carried on in one of the finest vocational school buildings in the State. The building contains a unit kitchen, a sewing and fitting room, model bathroom, dining room, dairy room, poultry room, carpentry shop, forge shop, agricultural and other laboratories, recitation and study rooms.

Five acres of ground (fig. 7) have been purchased for the use of the school. A baseball diamond, football field, running track, and tennis courts are available for the use of the school and people of

the community. A forestry nursery, fertilizer experiment plats, grain and grass plats, a vegetable garden, hotbeds, cold frames, etc., are maintained by the students for demonstration work.

The State department of education requires at least one room for the exclusive use of the agricultural schools, and when a regular recitation room is used another room is necessary as a laboratory. In addition to these two rooms there is provided a room to serve as a shop, in which is located the woodworking tools, the forge, and the anvil. One of the most, if not the most, complete equipments for vocational agricultural instruction in the State is to be found in the agricultural department of the Towanda High School. Over $1,000 was expended for equipment the first year. A recitation room, soils laboratory, a carpenter shop, forge room, school creamery, a poultry room, all of which have a very complete equipment for vocational agricultural instruction, exist. The agricultural instructor has been able to secure $450 worth of donations for equipment.

AVERAGE EQUIPMENT.

The following is a required list which represents the average equipment in a Pennsylvania State vocational school. Many of the articles listed are made in the shop, but some are collected locally and others are donated, as indicated above, by commercial firms.

REQUIRED SOILS APPARATUS FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Brass soil tubes, 6.
Support frame for above (not shop-made), 1.
Supply tank for same, 1.
Glass tubes (2 by 24 inches), 6.
Galvanized iron tank (6 by 8 by 24 inches), 1.
Support frame for same (shop-made), 1.
Aspirator bottle, with connections, 1.
Soil thermometer, 1.
Glass tubes (1 by 12 inches or 1½ by 12 inches), 4.
Rack or support frame for same (shop-made), 1.
Soil container for waste, 1.
Roll towel paper, 1.
Shears, 1 pair.
Mason fruit jars (1-quart), 12.
Specific gravity bottles (unadjusted), 6.
Drying oven, 1.
Evaporating dishes, 12.
Porcelain crucibles, 6.
Burettes (50 cc.), 2.
Balance weighing to 1/10 grams, 3 pairs.
Weights for each 1 kilo to 5 grams, 1 set.
Triple beam balance weighing 1/100 grams (centigrams), 1.
Extra weight for same, 1.
Magnifiers (tripod), 12.
Counter brushes, 2.
Tin funnels, 2.
Small bottles (4 or 8 ounces), 1 dozen.
Vials, a supply of.
Glass tubing (¼ inch diameter), 1 pound.
Graduated cylinders:
(550 cc.), 2.
(100 cc.), 3.
Hydrometer jars (250 cc.), 6.
Hydrometer, 1.
Glass funnels (4-inch or 6-inch diameter), 3.
Glass flasks (1-pint size), 12
Beakers (quart size), 3.
Beakers (200 cc.), 24.
Beakers brushes, 2.
Test tubes (⅝ inch by 5 inches), 24.
Test tube brushes, 1 dozen.
Bottles for solutions (half gallon), 6.
Rubber tubing (¼ inch), 12 feet.
Labels (three sizes), 3 boxes.
Gasoline blast lamps or equivalent (for schools not having gas), 2 or 3.
Scoops, 4.
Sieves (10–20–40–60–80–100 mesh), 6.
Tripods (6 inches in diameter), 3.
Pair pliers, 1 pair.
Soil pans, 6.
Cross section paper, 1 quire.
Rolling pin, 1.
Tin cans (old ones will do), 3 dozen.
Steel spatulas, 6.
Twine, 1 ball.
Paraffin wax, 1 pound.
Muslin, 2 yards.
Soil augur (can be made locally), 1.
Water bath, 1.
Soil bins, 4.
Vasculum (can be made by tinsmith), 1.
Drainage apparatus (shop-made), 1.
Pie plates, 12.
Red and blue litmus paper, 1 bottle or vial of each.
Filter paper (papers 2 inches in diameter), 1 pack.
Filter paper (6 inches in diameter), 1 pack.

SUPPLY COMPANIES.

Welch Scientific Co., Chicago, Ill.
Central Scientific Co., Chicago, Ill.
Columbia Supply Co., Indianapolis, Ind.
Elmer & Amends, New York, N. Y.
Arthur H. Thomas Co., Washington Square, Philadelphia, Pa.

REQUIRED POULTRY APPARATUS FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Prairie State incubator (100-egg size or larger), 1.
Cyphers incubator, 1.
Candee incubator, 1.
Killing knives (4 *kinds*), 4.
Game shears, 1 pair.
Dressing knives, 4.
Caponizing set, 1
Egg cartons and packages, crates, etc., supply of.
Feed hoppers of various types (commercial and shop-made), supply of.
Drinking fountains of various types, supply of.
Commercial trap nests, supply of.
Shop-made trap nests, supply of.
Brooders (one mammoth, one smaller size), 2.
Fattening crates (commercial and shop-made), supply of.
Egg tester (commercial, also one shop-made), 1
Spray pump, 1.
Exhibition coops (one or more) (both commercial and shop-made).
Oats sprouter (one or more) (both commercial and shop-made).
Catching hook (shop-made), 1.
Leg bands, collection of.
Various poultry feeds, collection of.
Poultry charts, supply of.
Insect powders and spray materials, collection of.
Poultry remedies, collection of.
Feathers (all types and kinds), collection of.
Supply of—
  Records.
  Incubators.
  Eggs.
  Brooders.
  Slaughters.
  Feeds.
  Fattening.
Collection of various types of eggs (normal and abnormal).
Egg candling chart, 1.
  (Bureau of Chemistry, U. S. D. A.)
Minimum-maximum thermometer, 1.

REQUIRED FORESTRY APPARATUS FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Forestry maps.
Tree calipers (shop-made).
Mattox, 1.
Axes (1 double bitted), 2.
Crosscut saw, 1.
Bark spud, 1.
Chain grabs, 1 pair.
Brush hook, 1.
Board rule (Scribners & Doyls), 2.
Collection of—
  Leaves.
  Twigs.
  Seeds.
  Weeds.
Log rule, 1.
Hypsometer (may be made in shop), 1.
Jacobs staff, 1.

REQUIRED CARPENTER SHOP EQUIPMENT FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Crosscut saws (24-inch, 10 pt., No. 7 Disston or equivalent), 4.
Rip saws (26-inch, 7 pt., No. 7 Disston or equivalent), 2.
Claw hammers (13-ounce Bell Face, A.E., No. 12 Hammon or equivalent), 8.
Framing squares (24-inch, No. 100 Br. Sargent or equivalent), 4.
Iron stock try-squares (6-inch, No. 5½ Disston or equivalent), 12.
Iron block planes (6 by 1½ inches, No. 9½ Stanley or equivalent), 12.
Iron Smooth planes (8 by 1¾ inches, No. 3 Stanley or equivalent), 3.
Jack planes (14-inch, No. 5 Stanley or equivalent), 12.
Iron jointer planes (22-inch, No. 7 Stanley or equivalent), 2.
No. 45 Stanley combination plane or equivalent, 1.
Beech gauges (No. 64½ Stanley or equivalent, Combination), 6.
Chisels, ⅛, ¼, ⅜, ½, ⅝, ¾, 1 to 2 inches, 1 each.
Chisels (½-inch and 1-inch), 12.
Dividers (8-inch winged No. 35 Socket Firmer), 2 pairs.
Sweep braces (8-inch), hatchets No. 323 Barbers or equivalent. Precision, 2 pairs.
Expansive bit wrights (¼ to 3 inches, large or equivalent), 7.
Drill bits (1 each No. 2-3-4-5 imported), 12 assorted.
Bits (2), screwdriver (1 each No. 10) ⅜ and ½ inch H. S. & Co. or equivalent.
R. J. bits in wood case, 1 set.
Rose countersink (¼-inch, No. 10, H. S. & Co. or equivalent), 1.
Reamer, 1.
Bit gauge, 1.
Hatchets (4-inch, No. 1½ Hammond shingling or equivalent), 2.
Mallets (No. 3, second growth hickory, square), 4.
Rulers (2-foot, 2-fold, No. 18 Stanley or equivalent), 12.

Nest of pruning saws, No. 3 Disston or equivalent, 1 nest.
Screw drivers (1 each 4, 6, 8 inch; blades, H. S. & Co. New Century or equivalent), 3.
Scrapers (steel cabinet, 3 by 6, H. S. & Co. or equivalent), 2.
Screws (hand 12-inch, Jorgenson, No. 2), ½ dozen.
Nail sets (1 each Nos. 1-2-3-4, H. S. & Co. or equivalent), 4.
Spokeshaves (iron handle with planing blade), 3.
Grindstone complete, Cyco (20 to 22 inches), 1.
Bench grinder (8-inch, Fyke Whirlwind, with pure carborundum wheel), 1.
Stone, carborundum No. 108, 8 by 2 by 1, double-faced combination, 2.
Drawshaves (8-inch, Witherby or equivalent), 2.
Spirit level (No. 0, 24-inch, Stanley or equivalent), 1.
Hack saws (12-inch, No. 4 Disston or equivalent), 6.
Glue pot, 1.
Glue, supply of.
Screws of all sizes.
Screw eyes.
Mitre box. Goddell Mfg. Co., Greenfield, Mass., 30-inch saw, 1.
Axe (forestry), 1.
Orange shellac, 1 gallon.
Wood alcohol, 1 gallon.
Varnish, 1 gallon.
Saws, 1 set.
Saw files (14 pt., 10 pt., 3 8-inch flat.
Dowel pin (sheet steel) cutter, 1.
Files, 1 each, wood hasp, flat ½ round; rattail, 4.
Work benches (6 double or 12 single. Long benches on side of room preferred.
Three-foot clamps, 3.
Monkey wrench, 1.
Pliers, 1 pair.
Stilson wrench, 1.
Tin shears, 1 pair.
Hack saw, 1.
Letters and numerals, *Lumber*, 1 each.
Coping saw, 1.
Boards, white pine, 12 feet by 12 by 1 inch, rough, 10.
Pieces, white pine, 12 feet by 6 by 2 inches, rough, 3.
Boards, white oak, 12 feet by 12 by 1 inch, rough, 5.
Pieces, white oak, 12 feet by 6 by 2 inches, rough, 2.
Pieces, white oak, 12 feet by 3 by 3 inches, rough, 2.
Boards, white pine, 10 feet by ½ by 8 inches, rough 5.

VEGETABLE GARDENING SUPPLIES FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Spade, 1.
Rakes (iron), 2.
Hoes, 3.
Wheelhoe. Combination seeder, 1.
Old store boxes (for making flats).
Hotbed / Cold frame } Lumber, sash, etc., for same.
Flats for germination tests.
Rotted manure.
Composted soil.
Vegetable seeds (all kinds).
Spotting boards, 6.
Wooden dibbers, 6.
Planting sticks, 6.
Watering cans (fine rose) (coarse rose), 2.
Sieves, large and small mesh, 2.
Trowel, 1.
Supply of—
  Pot labels.
  Bottles or slide covers for seed collections. (Punch and binding tape.)
  Rye straw.
  Seed catalogues.
Paper pots, 200.
Fertilizer sample set.
Fertilizers.
Small amount of land for stock crops.
Very desirable—
  A lean-to greenhouse.

FARM CROPS SUPPLIES FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Many of these supplies should be gathered during the summer, properly dried, and stored away for class use.

Germination boxes 28 by 14 by 3 inches (inside dimensions).
Grains, supply of.
Ear corn—Types and varieties, supply of.
  Supply 5 ears to each pupil.
Smooth wheat, 1 sheaf.
Bearded wheat, 1 sheaf.
Oats (side oats and spreading), 1 sheaf.
Sample plants.
Seed of each legume (kept in quart jars), 1 quart.
Mouse-proof storage box or some cans with covers.
Samples of 6 types of corn.
Samples of varieties of grains.
Collection of weeds. (Bulletin 580, U. S. Department of Agriculture.)
Collection of weed seeds.
Compound microscope.
Quart jars, 1 dozen.
Small platform scales.
Tripod magnifiers.
Several varieties of potatoes.
Riker mounts (for diseases).
Wad cutter (10 gauge).
Pasteboard.
Paste tape.
Glass (3¼ by 4¼ inches).
Formalin.
Water heater.
Thermometer.
Muslin, 5 yards.
Blotter paper, 6 squares.

REQUIRED LANDSCAPE GARDENING EQUIPMENT FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Ruling pens, 12.
Irregular curves, 6.
Higgins's drawing ink (black), 6 bottles.
Higgins's drawing ink (red), 2 bottles.
Drawing paper.
Tracing cloth,
Blue-print frame and paper.
Tree pruner, 1.
Hedge clipper, 1.
Two-hand shears, 1.
Pruning shears, 3.
50-foot tape line, 1.
100-foot tape line (steel graduated to feet and tenths), 1.
Mallets (3-pound), 4.
Gouges (1-inch), outside bevel, 4.
Chisels (1½-inch), heavy, 4.
Hand axe, 1.
Pruning saws, N. Y. S. pruner, 3.

BULBS AND CUTTINGS.

Small protractors, 2.
Thumb tacks.
Shrubs and seeds.

Very desirable:
Plane table and alidade.
Wheelbarrow.

REQUIRED FRUIT-GROWING EQUIPMENT FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Grafting knives and tools.
Pruning saws, 12.
Ladder.
One knapsack and one barrel sprayer, mounted.
Types of nozzles.
Materials for wax and cord or twine.
Sions and seedlings.
Packing table and boxes and wrappers.
Barrels and press.
Tools for planting.
Fruit for study and judging and identifying.
Paper plates for exhibits:
Apples.
Pears.
Peaches.
Grapes.
Plums.
Quinces.
Spray materials:
Lime.
Sulphur.
Copper sulphate.
Paris green.
Arsenate of lead.
Paints for wounds—Disinfectants.
Disease specimens.
Additional.
Lime sulphur cooker, 1.

REQUIRED ANIMAL-HUSBANDRY EQUIPMENT FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Horseshoes—Heavy and light; front and back; right and left.
Chart of animals—Pennsylvania Farmer.
Feeding rack.
Clippers.
Hoof tester.
Hoof clippers.
Rasp.
Creolin.
Oil-soap-sponge-emery cloth.
Sample of feeds.

EQUIPMENT OF DAIRY LABORATORY FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Twelve students' apparatus.

Cream separators (not over 400 pounds capacity), 3.
Barrel churns (not over 5-gallon capacity), 3.
Table butter worker, 1.
Cream scales, (1-bottle, graduated 9, 10, and 18 grams), 2.
Dippers (1 quart), 4.
Shotgun cans (12-quart), 6.
Chattillon milk scales (30 pounds graduated in 20th), 1.
Hand tester (12-bottle, closed), 1.
Butter paddles or spades (4 by 6 inch), 6.
Horse-hair sieves (8 inches in diameter), 2.

DAIRY GLASSWARE FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

All graduated glassware to be according to specifications recommended by the Official Dairy Instructor's Association and guaranteed accurate.

Ten per cent milk test bottles, 2 dozen.
Nine-gram 6-inch 50 per cent cream test bottles, 1 dozen.
17.6 cc. pipettes, 3 dozen.
Large-neck 6-ounce bottles, with corks, 4 dozen.
N. H. O. H. bottle, 1.
Acid bottles (10-14 ounce), marked "H_2SO_4 Poison", 6.
Acid measures (graduated 17.5 cc. and 8.8 cc.), 1 each.
Skim-milk bottles (graduated to 1/100 per cent), 1 dozen.
Lactometers, 2 each.
Burettes (50 cc., with pinch cock, graduated 1/10 per cent), 2.
Stands for above burettes, 2.
Dairy thermometers (graduated accurately to 212° F.), ½ dozen.
Trowbridge plugs for milk, 4.
Trowbridge plugs for cream, 4.
Pipettes (25 cc.), 6.
Ordinary water glasses for acid tests, 6.
Milk bottles brushes for test bottles, 12.
Wyandotte cleanser.
Scrubbing brushes, 2.
Waste crocks (5-gallon), 5.
Carboy commercial pure sulphuric acid, 1.82 sp. gr., 1.
Alcohol (95 per cent), 1.
Phenolphthalein, 2 ounces.

DAIRY APPARATUS FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Dairy apparatus can be secured from the following concerns:

D. H. Burrell & Co., Little Falls, N. Y.
Creamery Package Mfg. Co., 1307 Market Street, Philadelphia, Pa.
Dairymen's Supply Co., 1919 Market Street, Philadelphia, Pa.
Chester Dairy Supply Co., Chester, Pa.
Oakes & Burger, Cattaraugus, N. Y.
A. H. Barber Creamery Supply Co., Chicago, Ill.

DAIRY GLASSWARE.

Dairy glassware can be secured from the following concerns:

Louis F. Nafis, 511 Washington Boulevard Chicago, Ill.
Wagner Glass Works, 695-697 East 132d Street, New York, N. Y.
Also from any of the companies mentioned above under dairy apparatus.

REQUIRED FORGE EQUIPMENT FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

For 25 students.

	Approximate cost.
Forges, 4	$120.00
Hot chisel (1¼-inch), 1	.40
Cold chisel (1¼-inch), 1	.40
Flatters (2-inch), 2	.90
Swage (½-inch top), 1	.40
Swage (½-inch bottom), 1	.50
Heading tools (½-inch), 4	2.40
Punches (½-inch), 2	.70
Hardies (1½-inch), 5	2.70
Center punches, 4	.60
Steel squares, 4	1.00
Vail peen (16-ounce), 4	2.40
Flat peen (32-ounce), 4	2.40
Sledge (8-pound), 1	.72
Blacksmith vises (4½-inch), 2	9.00

	Approximate cost.
Anvils (100-pound), 4	$30.00
Tongs (½-inch), 1	1.20
Tongs (⅝-inch), 4	1.40
Tongs (¾-inch), 4	1.40
Tongs (⅞-inch), 4	1.80
Volt tongs (½-inch), 4	
Volt tongs (⅝-inch), 4	
Volt tongs (¾-inch), 4	
Volt tongs (⅞-inch), 4	
Shovels, 4	4.00
Pokers, 4	.80
Flat-files (12-inch), 2	.50
	187.52

Desirable.

Hand drill	9.50
Taps and dies (1 set) or screw plate	6.00
Grover, 1	
Horseshoe punch, 1	

FORGING PROJECTS FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Open link.
Pipe hook or cleft graft wedge.
Meat hook.
Hay hook.
Chain hook or clevis.
Gate hook.
Right angle brace.
Upset bolt head.
Chain links and ring, 3.
Splice weld.
Welded bolt head.
Whiffletree hook.
Chisel.
Cape chisel.
Horseshoe—Turn heels and weld on toe calk.

FARM MECHANICS FOR VOCATIONAL SCHOOLS AND DEPARTMENTS OF AGRICULTURE.

Soldering and tinning.

Soldering copper, 1½ pounds.
Sal ammoniac (solid preferred).
Flux (some kind).
Tinner snips (No. 9).
Ball Peers hammer (light).
Old tin can.
Galvanized iron.
Wash boilers.
Enameled ware.
Milk utensils.
Tin (20 tin) (1 sheet of 20 by 28), for four people.
Bottles and brushes for flux.
Pipe vise (No. 1), 1.
Small pipe cutter for 2-inch pipe, 1.
Stocks and dies, 1 complete set.
Sperm oil, 1 can.
Pipe reamer for 1½-inch pipe, 1.
Pipes and fittings.
Babbiting of bearings.
Ladle (large size).
Shafting and bearings.
Twine (heavy, smooth).
Cardboard.
Clay.
Scraping tools.
Wooden plug for oil hole.
Level (carpenter's).
Plumb bob.
Chalk.
Belt lacing.
Belt (6 inch), 1.
Belt (4 inch), 1.
Belt (2 inch), 1.
Rope, tying:
Ten feet of ½-inch rope for each student.
Two-inch pipe to tie around.
One level and one plane table and Aledalde.
Chaining 100 feet steel tape.
Crating and boxing.
Drain tile:
Four-horsepower gas engine for shop, with shafting for ripsaw, crosscut saw, lathe grindstone, churns, etc.

Vocational Agricultural School Books.

The following list of books has been passed upon by the textbook committee of the yearly conference (1916) to be used in the vocational agricultural schools of Pennsylvania.

The numbers 1, 2, and 3 following the names of the books will signify first, second, and third choice.

Soils:
Soils and Soil Fertility. Whitstone and Walster. Webb Publishing Co., St. Paul, Minn.
By Lyon and Pippin (2). Macmillan, New York.
By Hunt and Burkett (3).

Poultry:
Poultry Keeping (1). Lewis. Lippincott & Co., Philadelphia, Pa.
Poultry Production. Lippincott. Lea & Febiger, Philadelphia, Pa.

Forestry:
Farm Woodlot. Chauncy. Macmillan Co., New York.
By Moon and Brown (2). John Wiley & Sons.

Shop:
Farm Shopwork. Bryce and Mayne. American Book Co.

Farm crops:
Field Crops. Livingstone. Macmillan Co.
Field Crops. Wilson and Warburton (2). Webb Publishing Co.

Vegetable gardening:
Beginners' Garden Book. French. Macmillan Co.
Vegetable Gardening (2). Green. Webb Publishing Co., St. Paul, Minn.

Dairying:
Milk and Its Products (1). Wing. Macmillan Co.
Dairy, Cattle, and Milk Productions (2). Eckles. Macmillan Co.
Dairy Laboratory Manual. E. L. Anthony. John Wiley & Sons.[1]

Fruit growing:
Principles of Fruit Growing. Bailey (1). Revised edition. Macmillan Co.
Popular Fruit Growing. S. B. Green (2). Webb Publishing Co.

Fertilizers:
Fertilizers. Vorhees. Macmillan Co.

Animal husbandry:
Animal Husbandry for Schools. Harper. Macmillan Co.

Landscape gardening:
Committee could make no positive recommendation. Each individual will have to select a book from the following list that most nearly meets his conditions and ideas:
Manual of Gardening. Bailey. Macmillan Co.
Landscape Gardening. Maynard. John Wiley & Son.
Rural Improvement. Waugh. Orange Judd Co.
What, Where, When, and How to Plant. (Free.) By E. E. Bohlander Nursery, Tippecanoe City, Ohio.

[1] This manual is to be used by the fellows who have a school creamery and give a course in butter making.

Rural law:
Law for the American Farmer. Macmillan Co.
Farm bookkeeping:
Bexell and Nichols. American Book Co. The correspondence course at State College.
Farm management:
Farm management. Andrew Boss. Orange Judd Co., New York.

AGRICULTURAL LAW BOOKS.

1. Law for the American Farmer. John B. Green. Macmillan Co., New York.
2. Commercial Law. Tiffany's Handbook on Law of Sales. West Publishing Co., St. Paul, Minn. This last company publishes any law books that may be desired.

SHORT OUTLINE OF COURSE GIVEN HERE.

1. Division of law.
2. Courts—the classification of courts.
3. Property—kinds of property. (Important.)
4. Deeds. (Important.)
5. Mortgages. (Important.)
6. Boundaries.
7. Fixtures.
8. Express licenses—trespass etc.
9. Relation of landlord to tenant.
10. Sales, on shipment, etc.
11. Warranties.

VERMONT.

According to Prof. F. B. Jenks, of the University of Vermont, "the State has been fortunate in that there have been no compulsory laws such as has been passed in a number of States requiring the teaching of agriculture in every school without first allowing time for the teachers to prepare for it." A great many schools in Vermont are now making some attempt to teach agriculture and with varying degrees of success. The development along this line in the high schools and academies has been quite rapid. In 1913–14 there were only 4 schools employing a specially trained agricultural teacher. In 1914–15 there were 9; in 1915–16 there were 15, and during the present year (1916–17) there are 23.

LEGISLATION.

An act of 1912 provided for State aid for the teaching of agriculture, domestic economy, and manual training in the following manner:

> A town maintaining a high school of the first class may provide for and maintain courses or departments in manual training, domestic economy, or agriculture, with special instructors therefor, and if such courses or departments have been submitted to and approved by the State board of education, and if, for instruction in any of these courses or departments in a school year, not less than $600 has been paid in salaries, * * * the auditor of accounts, on certificate of the State board of education, shall draw an order for $200 for each course or department so maintained.

In the fall of 1912 four schools offered courses in agriculture under this act. The act also provides that the school boards in the various towns in a supervision union may unite to employ such special instructors under the same conditions as the individual town. At the present time, however, no such union has been formed.

An act of 1915, which provided for the establishment of junior and senior high schools, has made possible a more rapid and more ex-

tended advancement in the teaching of agriculture, although it provides no specific sum for this purpose. The following excerpts give the main features of this act:

CLASSIFICATION OF JUNIOR AND SENIOR HIGH SCHOOLS.

The State board of education may, with the approval of the directors in the towns concerned, divide the secondary schools of the State, now existing or hereinafter to be established, into two classes: (*a*) Junior high schools, having a four-year course; and (*b*) senior high schools, having a six-year course.

JUNIOR HIGH SCHOOLS.

Maintenance.—A junior high school may be maintained in any town, unless by arrangement an academy in a town is in effect made the public school thereof, where the number of secondary school pupils to be conveniently accommodated shall reasonably warrant it; but no academy shall be regarded as the public high school of a town, except upon the approval of the State board of education.

Courses.—Each junior high school shall have a four-year course, flexible in character, designed for the instruction of pupils who have completed an elementary course of not less than six years, and suitable to the number and needs of local pupils; and the State board of education shall arrange for a course of study, including vocational opportunities appropriate to the needs of the pupils in the several communities. In any town where a junior high school is established the State board of education shall make the necessary readjustment of the course of study in the elementary schools.

SENIOR HIGH SCHOOLS.

Establishment.—Wherever necessity requires and the school directors approve there may be as many central and readily accessible senior high schools, articulating directly with all neighboring junior high schools, as the number of pupils desiring the advanced instruction given only in this class of schools shall reasonably demand. The number and location of such schools, and the regions to be served thereby, shall be determined by the State board of education, and said board may designate an academy as a senior high school.

Courses.—Each senior high school shall have (*a*) a four-year junior course of study as in the junior high school, and (*b*) a two-year senior course of study in advance of the junior course of study, appropriate to the youth of 17 to 19 years of age, who are fitting for college, or are completing a course of general education, or are seeking advanced vocational education.

VOCATIONAL EDUCATION.

In junior high schools.—Junior high schools shall include, in accordance with such directions and regulations as to courses, teachers, and equipment as the State board of education may prescribe, within their courses of study a vocational course in one or two of the following subjects: Agriculture, manual arts, commercial subjects or domestic science, appropriate to the needs and environment of the particular school.

The expense of maintaining vocational courses in junior high schools shall be borne by the towns in which such schools are respectively located; and the State board of education shall annually, from the funds hereinafter appropriated, apportion such sums to reimburse the towns for such expense as will tend fairly to equalize the facilities afforded by such courses and the burden of maintaining the same, and the State board of education may provide, for use in connection with said schools and at the expense of the State, such land as may be required for suitable instruction in gardening and other appropriate study in agriculture.

In senior high schools.—Senior high schools shall include within their courses of study vocational courses as follows: (*a*) In the four-year junior division there shall be maintained in accordance with such directions and regulations as to courses, teachers, and equipment as the State board of education may prescribe, vocational courses in one or more of the following subjects: Agriculture, manual arts, commercial subjects or domestic science, appropriate for pupils from 12 to 16 years of age. (*b*) In the two-year senior division there shall be maintained advanced vocational courses in the subjects mentioned in subdivision (*a*) hereof, appropriate for pupils qualified for admission thereto, and the State board of education shall prescribe the requirements for such admission, and (*c*) the State board of education shall prescribe and supervise the vocational courses in senior high schools and appoint the teachers therefor.

The expense of maintaining vocational courses in senior high schools shall annually be apportioned by the State board of education between the State and the town served by such schools, and among said towns in such manner as will tend fairly to equalize the facilities afforded by such courses and the burden of maintaining the same; and the State board of education may provide, for use in connection with these said schools and at the expense of the State, such land as may be required for suitable instruction in gardening and other appropriate study in agriculture.

An act of the 1917 legislature provided for the transfer of a special school of agriculture located at Randolph, and one at Lyndonville, from the State board of agriculture to the State board of education, so that the two should now become a part of the public school system of the State and will be administered through the office of the commissioner of education.

QUALIFICATIONS AND DUTIES OF TEACHER OF AGRICULTURE.

1. The teacher of agriculture must be a man who is a graduate of an agricultural college or who possesses equivalent education and who has had practical farm experience sufficient to enable him to interpret local conditions.
2. He must be approved by the commissioner of education.
3. He must see that each boy carries out some home project which will cover an entire season.
4. It is strongly urged that he be engaged for the entire year, and that during the summer months he shall devote his time to the supervision of home projects, cooperating with the local county agent and the State leader in charge of boys' and girls' club work. It is further suggested that four weeks vacation be granted at such time as will least interfere with his work.

The commissioner of education of Vermont says:

> The organization within the junior high schools is sufficiently flexible to meet the needs of individual communities. If boys and girls must leave school in order to become wage earners, it is essential that we provide work such as to avoid their feeling in later life that they wasted even the time they did spend in school. In the rural communities much of the boy's work will hinge about agriculture, and the girls will in turn deal with the affairs of the household. Students within these schools will receive no less instruction in arithmetic, English, and the sciences. They will, however, study with some purpose, and thus they will better understand the significance of the subjects taught. In these schools the way must be kept open for those

who will eventually go to college, but we must not close our eyes to the fact that many will never reach such institutions, and they too are entitled to the best the State can offer.

CURRICULUM INCLUDING AGRICULTURAL COURSE.

The agricultural course consists of four years of work and is intended to give a boy whose education ceases with the high school an opportunity to secure something of a practical nature while in school. It also gives the boy who is preparing for college an opportunity to supplement his cultural knowledge with some useful information through the election of agricultural subjects. The agricultural course occupies the same place in the school curriculum as the English or Latin courses.

During the four years of the course the student receives approximately one hour of training each day through the means of recitations, laboratory work, and field demonstrations. Home projects in agriculture are carried on by each student during the summer vacation when he applies the knowledge gained during the school year. A school demonstration plat is conducted by some of these schools.

The following course will show the agricultural subjects studied (those marked with an asterisk (*) being required), and their place among other subjects in the curriculum, as offered at the Brandon High School:

First Year.

*English.
*Ancient history.
Physiology and botany.
Algebra.
*Elements of agriculture.

Second Year.

*English.
*Soils and crops (fall).
*Dairying (winter).
*Vegetable gardening (spring).
French, 1.
European history.
Physiology and botany.
Geometry.
German, 1.

Third Year.

*English.
*Live stock (fall).
*Feeds and feeding (winter).
*Fruit growing (spring).
*Chemistry.
French, 1.
German, 2.
Common law.
Geometry.
French, 2.

Fourth Year.

*English.
*Farm mechanics (fall).
*Farm management (winter and spring).
French, 2.
French, 3.
*Physics.
Common law.
*Business English.

ORLEANS HIGH SCHOOL.

The agricultural course in the Orleans High School has been selected by the State board of education as a good example of the possibilities of a well-developed four-year course in agriculture in

a typical Vermont town with a population of 1,131 and an assessed valuation of $863,960. Orleans is composed of a central village surrounded by farms. The village is prosperous and bustling and contains the types of business activities common to many Vermont towns, the lumber industry perhaps being the most important. The surrounding farming region is excellent and marks the community as primarily an agricultural one.

The problem of the school board in 1914 was not in the quality of the work done in the school, but was rather a twofold problem of a different nature. During the three years preceding, the average attendance in high school was only 35 out of a total average attendance of 232 for the same period. To increase high-school attendance and thus promote the efficiency of the whole school system was the first problem.

About 40 per cent of the high-school students have come from the districts outlying, mostly children of farmers. The old type of high school offered to these children little except courses designed to prepare for college. To offer to these boys and girls a kind of instruction which would link the school with their homes and give them a broader outlook upon life was the second problem.

Reports of the study of agriculture in other schools led the board of directors and the superintendent, Mr. E. L. Erwin, to believe that the solution of the second problem would go far toward solving the first problem; that is, to broaden the course of study and to utilize the things of common experience in the formation of this course would, it was thought, increase high-school attendance and thus increase the efficiency of the whole school system.

Steps were immediately taken to establish an agricultural course, and the superintendent of the district was instructed to engage a principal.

The school officials secured a principal trained for agricultural work and who had actual experience in organizing and putting upon a paying basis a school farm. The principal, thoroughly interested in the experiment, consented to come with the condition that he should be given free rein and at least $1,000 to equip a school farm. He agreed to stay for at least three years. The successful outcome of the school proves the wisdom of the school board in accepting these conditions.

After the foregoing brief description of preliminary matters, it will perhaps be well to put once more concretely the purposes of the principal.

1. To make the agriculture and home economics training a part of a course which will give the pupils an insight into as many occupations as possible, and thus enable them the better to choose their life work.

2. To offer to as many boys and girls as possible an idea of agriculture as one of the elements of a broad education fitting for any profession.

3. To offer to such boys and girls as desire it a chance to learn agriculture as a profession.

4. To build up in a small high school an agriculture equipment, including a school farm, for less than $1,000 and to make it pay its way when once established.

The work in agriculture centers around the school farm. The principal was offered by the directors his choice of two pieces of land, the one a most fertile tract of 6 acres somewhat distant from the school and the other a plat of about 2 acres, consisting mostly of swampy land directly back of the schoolhouse. The principal chose the latter plat of 2 acres because of its accessibility and because of the opportunity to improve it. Through a generous gift of part of the land by two public-spirited citizens this plat was secured and is now owned by the town as part of the school property.

The boys at once set about clearing the land of rocks, stumps, and willow bushes and finished it at an expense of $8.25. The school board then voted $200 for tile-draining the land. The boys borrowed surveying instruments, and with them laid out the farm, ran the lines of their draining trenches and assisted in the ditching, the laying and joining of the tile, and had a hand in every process concerned. This was finished at a cost of $197.97.

A plan of the farm was now made from the surveys and after careful study the following divisions were decided upon as being the best arrangement for a Vermont farm: (1) Orchard, (2) forest, (3) rotation plat, (4) potato plat, (5) grass plat, (6) museum garden, and (7) kitchen garden for grades.

The orchard and nursery first claimed the attention of another class. A plat 200 by 90 feet has been set apart for the orchard. The class spent some time in studying the subject and especially in ascertaining the varieties of fruits best suited for the region. They then drew a plan of the orchard, staked out the ground, and dug the holes for the trees. The stock was ordered from a fruit nursery. It was decided to have permanent trees, and fillers, and to plant small fruits between the rows.

The class set out in the nursery all the stock which was left. In the spring the class sprayed the trees, did work in budding and grafting and replaced from the nursery all varieties which had died during the winter. This orcharding was done entirely by the boys and at a cost of $27.80.

During the winter the class studied forestry and in the spring staked out their forest. From the Vermont State Nursery, through the kindness of the State forester, the class obtained the spruce, pine,

hemlock, and cedar trees which it had decided to plant and the forest was set out. In the spring of the next year the forestry class as an Arbor Day exercise replaced the dead trees from the nursery in the presence of all the school children of the community. The school forest was planted entirely by the boys and at a cost of $2 for express charges on the trees.

The rotation plat was staked out and after study the following rotation of crops was determined upon: Corn, potatoes, oats, and grass for two years. The crops were planted, cultivated, and partly harvested by the boys.

A museum plat was laid out; this was divided into 38 small divisions, each containing a grain or vegetable which the pupil having charge of the same wished to study. The museum plat was simply for the purpose of investigation, and the pupils were allowed to plant in it whatever they pleased.

The remaining division of the school farm was utilized as kitchen gardens for the grades. There were four of these gardens, each 40 by 60 feet, and they were planted and cared for by the pupils of the grades under the direction of and with the assistance of the high-school students. The products were taken by the children to their homes. These kitchen gardens thus served a double purpose: First, to interest the children in the subject of agriculture, and second, to give the high-school boys an opportunity to use their training.

Much of the material raised has been given away, but some of the products of the school farm have been disposed of for money and this money turned in to the town treasury. But more important than all else, the school farm has furnished for the boys and girls of Orleans an out-of-door laboratory for the study of these things which are most closely related to the life of the average Vermont child.

A greenhouse was part of the equipment which the principal had in mind, and at his request the school board appropriated $400 to erect one. The subject was thoroughly studied in the classroom, and complete plans for a 15 by 30 foot lean-to greenhouse were discussed and drafted by the boys. The class then listed all materials and equipment needed and secured prices on the same from local firms. After comparing prices, the material was ordered. Because of the lateness of the season, workmen from the town were engaged to erect the greenhouse, but the boys took an active part in each of the building processes—cement work, carpentry, glazing, plumbing, and wiring. The greenhouse was built adjoining a building belonging to the school, and the class prepared the old building, in which the heating plant was to be installed, by excavating, making a cement foundation for the boiler, and cutting doors and necessary openings.

The greenhouse is used as a winter laboratory. Radishes, lettuce, cucumbers, tomatoes, flowers, etc., are cultivated. Bee

culture is made a part of the course, and the equipment includes a swarm of bees. All the space in the greenhouse is utilized. Under the benches chickens are kept in coops, thus making brooders unnecessary. Experiments of various kinds are carried on in the greenhouse. Soils are analyzed, the value of various kinds of fertilizers is determined, the pollenization of plants is studied, and many other activities are taken up. The value of the greenhouse as a winter laboratory is very great.

As in the case of the farm, the products of the greenhouse are sold. Early vegetables find a ready market among the townspeople. Much is given away. The greenhouse is cared for by the class, and especially by one boy, who has a very attractive room near the boiler and who has charge of the heating. The total cost of the greenhouse, including all equipment, was $448.12.

In order to study dairying in a practical way, the boys felt the need of a laboratory. It was therefore decided to equip a dairy room in the basement of the schoolhouse. Permission was secured from the school board, and $60 was voted to defray the expense. This work, as in all other projects, was largely done by the boys, including carpentry, cement work, and plumbing. A small room was furnished and equipped as follows: Two separators (loaned by separator companies), milk cooler, churn, butter worker, cheese vat, press, and other necessary utensils, furnished by local creamery at cost.

The total cost of the dairy room, covering both building and equipment, was $62.03.

Training in the actual manufacture of butter and cheese is given, and such other practical work as is connected with dairying.

The latest addition to the school plant is a poultry house. Much interest in poultry raising evinced itself among the boys, and it was decided to ask the school board for a poultry house. The board voted for this purpose $75. Plans were drawn for a house 12 by 24 feet, 8 feet high in front and 4 feet high in the rear. There are two yards 12 by 60 feet, with doors from each opening into the house. The material was estimated and purchased by the boys, and the building has been entirely constructed by them. It is interesting to note that they agreed during the spring to work certain days each week and to begin the day's work at 5 a. m., and work till schooltime. Not a boy failed to be on the job promptly at the time set.

Manual training is taught not as a separate course, but in correlation with every subject. In the different projects outlined above, the best possible training in carpentry, plumbing, glazing, cement work, and repair work has been furnished. The boys of the ninth grade sold soap, and with the proceeds bought tools. They made the tomato-plant boxes for the greenhouse.

The summary of cost for the plant and equipment is as follows:

Clearing of land and plowing	$8.25
Tile draining	197.97
Orchard	27.80
Forest	2.20
Greenhouse	448.12
Dairy laboratory	62.03
Poultry house (estimated)	60.00
Total	806.37

Last year if the one item, coal, is omitted, the farm and greenhouse showed a profit of $17.74 over and above all expenses.

ANNUAL VERMONT STATE BOYS' AND GIRLS' AGRICULTURAL AND INDUSTRIAL EXPOSITION.

The first plan for a State boys' and girls' exposition was worked out in the fall of 1914 in Windsor County by the Young Men's Christian Association, when a successful exposition was held in the Kennedy arena at Windsor, Vt. The following year, with the help of an appropriation provided by the legislature and the cooperation of various organizations and the State board of education, another very successful exposition was held in October, 1915, on the fair grounds at Rutland, Vt.

The annual convention of the State Teachers' Association of Vermont was held in Burlington during the week of the third exposition. The main object of these expositions is to arouse more general public interest in vocational education and industrial training. The plan is for such schools to use schoolroom equipment, photographs, charts, and signs, to illustrate their work and to give with groups of pupils actual classroom demonstrations of such projects as cooking, garment making, baking, canning, basketry, blacksmithing, butter making, mechanical arts, printing, carpentry work, electrical work, metal work, cement work, etc.

SUPERVISION.

Prior to 1916 there was no supervision of this work except what was done by the department of agricultural education in the State College of Agriculture upon its own initiative. Early in 1916, however, the following agreement was entered into with the State department of education and the College of Agriculture of the University of Vermont:

Memorandum of understanding between the State Board of Education and the State Agricultural College concerning cooperation in the promotion of the teaching of agriculture and household economy in the public schools of Vermont.

I. The State Board of Education, through its executive officer, the Commissioner of Education, invites the State Agricultural College to cooperate in the promotion of the teaching of agriculture and household economy in the public schools and to

assist in the supervision of (*a*) junior high schools, (*b*) agriculture and household economy in all other high schools, and (*c*) organization and encouragement of boys' and girls' agricultural and home-makers' clubs and promotion of exhibits of products of such clubs.

II. The State Agricultural College accepts the invitation of the State Board of Education to cooperate in the ways above mentioned and agrees through the department of agricultural education to assist in the supervision of high-school work to the following extent: One man to devote one-half of his time and as soon as practicable one woman to devote one-half of her time to the work above mentioned under (*a*) and (*b*). It agrees through the agricultural extension service to assign one man to devote all his time to the work above mentioned under (*c*).

III. All representatives of the State Agricultural College who assist in the supervision or other cooperative work shall report to the Commissioner of Education as occasion demands, and a written report shall be presented to the State Commissioner of Education at the close of the school year, setting forth work attempted and accomplished, together with recommendations.

(Signed) J. L. Hills, *Dean*.
Mason S. Stone, *Commissioner of Education*.

Several visits are made to each school during the year, the visits varying from one to several days in length, as conditions warrant.

The teachers are urged to keep in close touch, not only with the central office, but with each other through correspondence and personal visitation. A circular letter is sent to each school about once a month which includes reports of the most successful work accomplished. Reports of the visits of the supervisor are placed on file in the commissioner's office, including not only a report of conditions, but recommendations made to teachers and superintendents for improvement. Teachers are required to keep records of work attempted and results obtained.

EQUIPMENT.

Results are demanded, rather than equipment, and only such things as are essential to the success of this course are required. The following list is suggested, however, as a minimum need:

EQUIPMENT FOR AGRICULTURAL LABORATORY.

Balance, decimal milk, 1	$4.00	Graduates, cone shaped (1,000 c. c.), 1	$1.25
Soil containers, 6	6.00	Spatulas (6 inches), 6	2.52
Scoop (8 inches by 5½ inches), 3	.66	Burette (50 c. c.), 1	1.00
Soil thermometer, 1	1.40	Support, burette, 1	1.10
Flower pots, paper, 4 inches, 50	.55	Linen tape (40 feet), 1	.85
Flower pots, paper, 6 inches, 50	1.13	Magnifier, import, 6	2.40
Pruning shears, 6	2.40	Blue pencil for glass, 2	.34
Pruning saw, 1	.75	Wide mouth bottles (4-ounce), 2 dozen	.84
Pruning shears, 1	1.85	Wide mouth bottles (8-ounce), 2 dozen	1.20
Grafting chisel, 1	1.10	Chemical thermometer, 3	2.40
Grafting knife, 6	1.68	"Captain" barrel sprayer (size 632) with 25 feet hose, 8 feet extension pipe, and 2 Simplex nozzles. The Deming Co., Salem, Ohio, 1	15.00
Dividers, 5½ inches, 2	.60	Babcock milk tester (complete, 12 bottles). Creamery Package Co., Chicago, or Vermont Farm Machine Co., Bellows Falls, 1	14.00
"Cenco" trip scale, agate bearing, 1	6.65		
Weights, iron—5 grain to 1 kilo, 2	2.40		
Weights, brass in block (1 grain to 1,000), 1	4.00		
Graduates, cylindrical (100 c. c.), 4	2.24		
Graduates, cone shaped (500 c. c.), 2	1.64		

Carpenter's tools, 1 set	$4.50	Spring balances, (25 pounds), 2 pairs	$0.80
Cheesecloth, 5 yards	.25	Rosin, 1 pound	
Absorbent cotton, 1 pound	.35	Beeswax, 1 pound	
Twine, 1 ball	.10	Tallow, 5 pounds	
Shears (10-inch), 3 pairs	.30	Lime, 10 pounds	
Glass jars (telephone (1 pint), 24	1.70	Copper sulphate, 10 pounds	
Glass tumblers, 24	.30	Arsenate of lead, 1 pound	
Student-lamp chimneys, 48	3.00	Formaldehyde (formalin), 2 pounds	
Soup plates, 24	2.40	Corrosive sublimate tablets, 1 box	
Window glass (covers for plates 10 by 10 inches), 24	2.40	Farrington tablets, 1 box	
		Washing powder, 1 box	
Granite-ware pans, 24	2.40	N-10 NaOH, 1 quart	
12-inch rulers, 12	.60	Calcium acetate, 8 ounces, for soil acidity test	
Garbage can, 1	.75	Phenolphthalin, 1 ounce, for soil acidity test	

PROFESSIONAL IMPROVEMENT.

Conferences of two days or more are held during the year, when all the teachers of agriculture get together to discuss local and State problems and methods of meeting them. Group conferences for certain districts are also called from time to time as occasion demands. One conference is held during the summer. It is planned to use students who are preparing to teach agriculture as assistants during the last half of the school year and as field workers during the summer months, thus releasing a number of the regular teachers during the summer months each year in order that they may attend summer sessions.

SOME FEATURES OF AGRICULTURAL INSTRUCTION IN HIGH SCHOOLS.

Jeffersonville (Vt.) Junior High School.—A plat of ground at the rear of the school is being used as a kitchen garden, and an attempt is being made to see how much and how many different kinds of vegetables may be grown in a year, and the products are used in the home economics class in canning and for school lunches later in the season. The boys in manual training will get practical experience in constructing cold frames at the rear of the school building. These cold frames will be used in getting plants started early for the kitchen garden.

A group of first, second, and third year students in agriculture got practical experience in gardening under the direction of the agricultural teacher on a vacant lot, and the summer care of this garden was attended to by the owner of the land. These students were able to grow profitably beets, carrots, swiss chard, as well as other vegetables, some of which were canned and others stored to be used for school lunches during the winter term.

A free trip to Burlington in order to attend the Annual Vermont State Boys' and Girls' Agricultural and Industrial Exposition was offered as a prize by the principal to the boy in the first and second year agriculture who would grow the largest amount of tomatoes from six plants.

The agricultural teacher, who is also principal of the school, has rendered valuable service to the community, which is largely interested in dairying, by furnishing through the local paper current information on agriculture to the farmers, and also by using as laboratory work for the students in agriculture milk testing of dairy herds in the community. Agriculture is a required subject in this school.

Brandon (Vt.) High School.—One acre of land is used for a demonstration garden, and the class in horticulture keeps in proper shape a young orchard. For practice in connection with the animal husbandry work, 10 boys took 10 cows each, weighed and tested the milk, weighed and made rations for two months, February and March, and thus determined for the farmers those cows that were profitable. As a result of this relationship between the school and the farmers of the community, several farmers have purchased scales and are weighing and testing their own milk.

One feature of the work in animal husbandry is the practice followed by the teacher in assigning to a student in the class the problem of selling a horse, cow, or hog to the other members of his class. It is very evident at a glance that such a method of instruction makes the work in animal husbandry very real, concrete, and practical. A similar method of procedure is followed in connection with the instruction in farm management wherein boys are assigned the problem of selling a farm in the community to the other members of the class. Such a sale involves a knowledge not only of the soil and its productive capacity, but also a knowledge of the relationship between crop and live stock production and the marketing of these products. Here, again, is given the boys in farm management a problem which involves a very searching review of all they have learned, and more, too, in the three years previous in soils, farm crops, horticulture, animal husbandry, dairying, farm mechanics, and rural economics.

The school and home project work of this and other schools of the State is closely correlated with the club project work of the extension division of the State College of Agriculture. This division furnishes to the agricultural teacher follow-up material on market garden projects, potato projects, corn projects, poultry projects, pig club projects, and farm and home handicraft projects.

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