

UNITED STATES BUREAU OF EDUCATION

BULLETIN, 1913, NO. 14

WHOLE NUMBER 522

AGRICULTURAL INSTRUCTION IN SECONDARY SCHOOLS

PAPERS READ AT THE THIRD ANNUAL
MEETING OF THE AMERICAN ASSOCIA-
TION FOR THE ADVANCEMENT OF
AGRICULTURAL TEACHING
ATLANTA, GA., NOVEMBER 12, 1912



WASHINGTON
GOVERNMENT PRINTING OFFICE
1913

CONTENTS.

	Page.
Letter of transmittal.....	5
I. The opportunity and responsibility for the preparation of teachers of agriculture.....	7
(a) By agricultural colleges in their regular courses and classes. By H. L. Russell, University of Wisconsin.....	7
(b) By agricultural colleges in special courses and classes organized for this work. By Kenyon L. Butterfield, Amherst, Mass.....	8
II. The first year's work in agriculture in the high school. By W. G. Hummel, Berkeley, Cal.....	11
III. What relation should exist between the experiment stations and the secondary schools of agriculture. By President A. M. Soule, Athens, Ga.....	20
IV. The use of land in connection with agricultural teaching.....	24
(a) In special agricultural schools. By C. G. Selvig, Crookston, Minn.....	24
(b) In high schools. By Rufus W. Stimson, Boston, Mass.....	30
(c) In elementary schools.....	39
APPENDIX A.—Summary of information from special schools or current bulletins.....	42
APPENDIX B.—Demonstration work at Northwest School of Agriculture, Crookston, Minn.....	45
APPENDIX C.—List of 1912 suggestive topics for "summer practicum" work, Northwest School of Agriculture, Crookston, Minn.....	47
APPENDIX D.—Massachusetts State-aided vocational agricultural education: Examples of the income of pupils from farm work during attendance at school in 1912.....	48
APPENDIX E.—Questionnaires sent out.....	49

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,

BUREAU OF EDUCATION,

Washington, D. C., March 21, 1913.

SIR: Interest in agricultural education continues to increase. The attempt to teach agriculture is no longer confined to the agricultural college and special agricultural school. In all parts of the country the attempt is made with more or less success in public high schools and to some extent in the elementary schools. Methods of teaching the important facts and the elementary principles of agriculture are discussed in the meetings of most of our educational associations. There is a large demand from teachers and school officers for any printed matter on this subject that will help them in determining what to teach, and how to teach it, and how to organize schools and adjust courses of study so as to get the best results from the new studies without losing the best in the old. There is also an earnest demand for helpful advice in regard to the preparation of teachers of agriculture in schools of a grade lower than that of the college. The papers read before the American Association for the Advancement of Agricultural Teaching at its meeting in Atlanta, Ga., November 12, 1912, contained much valuable material for those interested in this subject. For this reason they are submitted herewith for publication as a bulletin of the Bureau of Education.

Respectfully submitted.

P. P. CLAXTON,
Commissioner.

The SECRETARY OF THE INTERIOR.

AGRICULTURAL INSTRUCTION IN SECONDARY SCHOOLS.

I. THE OPPORTUNITY AND RESPONSIBILITY FOR THE PREPARATION OF TEACHERS OF AGRICULTURE.

(a) BY AGRICULTURAL COLLEGES IN THEIR REGULAR COURSES AND CLASSES.

H. L. RUSSELL, University of Wisconsin.

The primary question is, What should be the preparation which is given teachers who are going to present the subject of agriculture in the public-school system?

There are three points, in my judgment, which should be emphasized in connection with this matter:

- (1) The acquisition of the subject matter by the student.
- (2) The mode of imparting the information necessary in connection with the course.
- (3) The desirability of having the student consciously choose his course sufficiently early, so as to perfect his training for teaching work.

Relative to the acquisition of the subject matter, in my judgment this work can better be performed in the regular courses of an agricultural college than is possible in special courses designed exclusively for students of this class.

Successful teaching of agriculture requires thorough knowledge, not only of the practical side, but of the fundamental and theoretical aspects which underlie the subject. These are the same, whether a student is going to teach the subject or practice. The student who is to become a teacher of medicine must carry on the dissection work, laboratory work, or other class work in a manner comparable to that which would obtain if he was to become a practitioner of medicine. It would be an unnecessary waste of resources to duplicate the courses which are designed to present the subject matter so that the same may be most readily and perfectly acquired by the student.

With reference to the second topic, the mode of imparting the information which has been derived from the first group of courses constitutes the pedagogics of the subject, and should be specifically taught to the student in a professional course on teaching. It is in this realm that the main work of the department of agricultural education should be developed. There are good and bad ways in which

teaching may be carried on, and it is quite as important for the student to know from direct experience some of the poor and undesirable methods in which the subject may be presented as to know the most approved standards for imparting such information. Naturally, this work is of a technical character and constitutes the professional part of the training of the teacher; consequently, such courses must of necessity be organized on a separate basis from the regular classes of the institution.

If the profession of teaching is going to be anything more than a makeshift, or a stepping stone to some other vocation, it is manifestly desirable that the student consciously choose his course sufficiently early, so that he may perfect his training in this direction so far as it may be desirable for him so to do.

The time is perhaps already here in which we should formulate a more or less definite course of study designed to train the student in this direction. No field in agricultural development is going to offer a wider opportunity than that which just now obtains with reference to the training of teachers, and it is highly desirable that students entering this avenue of activity should consciously prepare for this work as far as possible. To do this, a student should secure a broad foundation rather than specialize in any one phase of agricultural development.

The great majority of our agricultural students in the upper years of their course specialize in live stock, agronomy, horticulture, etc., throwing the major part of their energies into the prosecution of work in their chosen line, together with cognate subjects.

With reference to the student who contemplates entering the profession of teaching, this course may perhaps not be the most advisable for him to follow. It is desirable for him to get a general working knowledge of the various phases of agricultural development. If he is required to elect a major line, this could well be taken in the pedagogical aspect of the subject in which his course in agricultural education could be correlated with those in the general field of education, leaving a considerable time of his course open in which he can pursue the general informative courses in agriculture, together with the fundamental sciences on which agricultural knowledge is based.

(b) BY AGRICULTURAL COLLEGES IN SPECIAL COURSES AND CLASSES ORGANIZED FOR THIS WORK.

KENTON L. BUTTERFIELD, Amherst, Mass.

I assume that the agricultural colleges will be called upon to prepare teachers of agriculture for agricultural departments of high schools, to prepare principals and teachers of agriculture in agricultural high schools, teachers of agriculture in normal schools, and members

of the faculty of agricultural colleges. This list excludes the public-school teachers who give school garden work or elementary agriculture, and whose training ordinarily would be received at the normal schools.

As a rule it is desirable that teachers of agriculture should be prepared through regular college courses and classes at the agricultural college. In other words, it is to be hoped that such teachers will have taken a full college course in agriculture in special preparation for the teaching of the subject. But for a long time to come it will be necessary to supplement this training by special courses and classes. These special courses will accommodate teachers already in service. To some degree, teachers of elementary agriculture and school garden work will find special courses at the agricultural college of the greatest service. Teachers of science in public schools, teachers of agriculture in public high schools, the younger teachers in agricultural schools, and frequently some of the younger teachers in our agricultural colleges will find it desirable, and even necessary, to spend some time at the agricultural college in supplementary work along agricultural lines.

In general there are three types of work to be offered by the agricultural colleges in special courses and classes:

1. Courses in technical agriculture. I am inclined to think that for this special work all of the groups mentioned will desire to pursue technical work rather than to study teaching methods. If a teacher has had a fair normal training, the particular gain of coming to an agricultural college for a special course is to get into the agricultural atmosphere and to sit under the instruction of experts in scientific and practical agriculture.

2. However, this study of agriculture should be supplemented by practical fieldwork, which is designed to teach the use of land and the handling of stock, as, for example, poultry or bees. In other words, these teachers want to come into very close touch with the problem of manipulation of material. In a certain sense this is a study of teaching methods, but it is a method of teaching that is vital and not formal.

3. The problems of community building are also important, because all of these groups of teachers, especially those employed in agricultural departments of high schools and in agricultural high schools, should be real community leaders and should attempt to relate the school in the most vital way to the problems of the community, both industrial and social. Now, some study of the economic and social phases of rural life is important.

These three groups of work are, in my judgment, most likely to meet the needs of teachers of agriculture already in service who come to an agricultural college for supplementary work.

The organization of courses depends entirely upon the classes of people who come for the work and upon the facilities of the institution. In general there would be three groups:

1. A one-year special course in which the regular courses are used to a certain extent, but in which the subjects are so organized that the course takes on all the characteristics of a special course. This course will fit the needs of normal-school graduates who have had very little agriculture and the teachers of agriculture in high schools whose training has been largely in the sciences rather than in agriculture. Undoubtedly also there will soon be need of offering a year of graduate study in professional agricultural teaching work, even for graduates of agricultural colleges who desire to continue in the teaching profession.

2. Doubtless for some time to come the main reliance in special courses and classes will be the summer school of agriculture. Practically all of our agricultural colleges have such a school, and it is here that the larger number of students will resort.

3. It is possible that correspondence courses in agriculture and in agricultural education may be found useful for teachers in service who wish to supplement summer school with continued reading and study throughout the year.

There is another sense in which the word "special" may be applied in this discussion; Dean Russell suggested the question: Is it desirable to organize special courses for the regular students of agricultural education who follow a four-year course? Undoubtedly we must face this question at our agricultural colleges. Some of our teachers of agricultural pedagogy hold that existing college courses in science—say, in chemistry, for example—do not meet the need of the prospective teacher who must handle chemistry as a subject for the pupil in the agricultural high school in an entirely different way from its conventional method of presentation to the college student. The conventional college method is that of analysis, and the teaching is logical and formal. The method by which the adolescent learns is concrete and objective. Now, our problem is: Shall we organize within the college special courses in chemistry or in biology which bring the material of the subject together in this concrete and objective way, in order that the prospective teacher may the better learn how to present this subject when he comes to teach in the agricultural high school? Personally I think we must go very slowly at this point, not only because of legitimate questions concerning the method, but also because of administrative difficulties, such as the fact that only a small proportion of prospective teachers of agriculture are firm in their vocational intent during the early years of their college course when they must study the sciences, and also because of the large expense

involved in organizing separate courses. At the same time, we can not ignore the question.

It is evident that while we should lay special stress upon the preparation of teachers of agriculture through regular college courses and classes, we must for a long time to come, perhaps indefinitely, make provision for special courses and classes in order that the teachers already in service may gain the benefits that come from residence at the agricultural college.

II. THE FIRST YEAR'S WORK IN AGRICULTURE IN THE HIGH SCHOOL.

W. G. HUMMEL, Berkeley, Cal.

That wise selection and proper presentation of the agricultural work of the first high-school year is of supreme importance is unquestioned. On this depends the success of the work which is to follow. Though elementary, the work must be scientific and thorough in its presentation of selected topics. It must include instruction in the fundamental principles of agriculture and must emphasize the scientific basis of the industry. It must be both practical agriculture and sound science. In addition, the materials of the course should be so selected and organized as to present, as a whole, a well-balanced unit of agricultural study.

Present conditions as to the teaching of first-year agriculture in the high school can hardly be called satisfactory. Some excellent courses are being given, it is true, but there are more poor ones. Even where courses are good in themselves, they are frequently quite unlike first-year courses in any other high school. This in turn necessitates differences in the agricultural courses of later years, and makes difficult the transfer of credits for students from the agricultural department of one school to that of another. It also tends to delay the giving of just university credit for high-school work in agriculture.

Of the many poor first-year agricultural courses now being given, some are due to the fact that so many unexpert teachers, though perhaps well informed agriculturally and scientifically, lose sight of the great purpose of the beginning course and the psychologic and other reasons which should determine its materials and methods. Looking only to names, they choose from the multitude of names applied to first-year work that which appeals to them most, such as farm crops, soils, etc., and start a course under that name. And though excellent beginning courses are being given in many parts of the country under such names, yet in the hands of teachers copying the name rather than the materials, such a course frequently becomes too highly specialized for a beginning course and fails to lay the desired foundation for the work of later years. Or, going to the other extreme, teachers

sometimes give preparatory courses so general that they take up animal life, plant life, farm mechanics, and farm management, thus including so much that the course fails to teach any one thing well. It fails to fix important basic principles and degenerates to a mere collection of agricultural facts, the scientific foundation and principles of which are little understood.

It is evident, then, that we need better agricultural courses in the first year of the high school. We need a more careful outlining of the work. We need greater uniformity in the content and nomenclature of the work as given in different schools. We need a better balance between first-year instruction in practical agriculture and in the basic scientific facts on which agriculture rests.

Before attempting to say how this is to be secured, let us review briefly the science situation in the high school, since successful agricultural instruction is so closely related to it.

That the teaching of the physical and the biological sciences in the high school has been unsatisfactory in many ways has been admitted for years. The educational results of high-school science are neither all that was hoped or predicted when it was introduced into the high-school curriculum. In many schools the number of students electing such work is falling off. The materials used are criticized as not sufficiently related to the life and needs of students. The results attained are said to be too often unsatisfactory both as to the knowledge gained by the student and in the acquiring of a proper attitude toward scientific work.

Many remedies have been proposed, such as a rearrangement of the science courses, more careful selection of the first-year science subjects, the introduction of many applications of science in instruction, and so on. The science work has undoubtedly been improved by the adoption of these suggestions, but observation and experience show that they have not brought about all the improvement desired. Even when the science work is carefully arranged and many of its applications introduced, it too frequently fails to hold the attention of pupils and to secure the educational results desired. With first-year pupils especially, the science work has failed to prove attractive or beneficial.

The reason most commonly given for this is that, though for the fullest understanding of any one science there must be an accompanying knowledge of other sciences, yet in the high school the sciences have all been pigeonholed in various semesters or years and unrelated to each other. It is also recognized that another thing prejudicial to the full success of science teaching in the high school lies in the fact that the first-year pupil lacks sufficient apperceptive basis for any special course dealing with the theories and problems of pure science. He is, therefore, apt to be repelled by such work. Even when the first-

year work includes many applications of the science studied to everyday life, it is apt to prove unattractive, for the pupil lacks sufficient information to fully appreciate or understand many of these applications until he has had something of other sciences. Yet the teacher can not take time, in a special science course, such as botany, for example—crowded with materials to be gone over in a limited time—to introduce and demonstrate and explain chemical and other facts which the pupil needs to know in order to understand fully certain applications of botanical facts. Moreover, first-year students are naturally what we may call superficial. Their interests spread over a large area, but do not go very deeply. They are interested in the many wonderful and fascinating things in the world about them and wish to understand them. They like to experiment, to see demonstrations. They like studies related to life. But work limited to a single special science, and but vaguely related to life, does not appeal to them.

It seems, then, that no one of the special high-school sciences proves attractive to first-year pupils or gives them a view of as broad a field as is desirable. No one subject alone, experience indicates, so stimulates interest and engages attention as would a wise selection from the whole field of scientific knowledge.

The suggestion was therefore made by schoolmen interested in the improvement of the high-school science work, as long as a decade ago, that the first-year science work might well be a general introduction to science, having its roots in all the high-school sciences. It could thus, it was argued, be given variety and made full of demonstrations and laboratory experiments which would appeal to the interest, arouse the enthusiasm, and increase the desire of the student for more and deeper knowledge. A background would thus be given for the different scientific studies; they could be related to the pupil's environment and to each other; and students would be prepared for the more formal and specialized study of the various branches of high-school science in the following year.

Many other excellent arguments were also given for the general-science course for the first high-school year. Schoolmen quickly recognized the justice of the arguments, and general-science courses were introduced in many localities. But though the purpose of the courses was admirable, and the advantages apparent, it was found that there was danger of giving disconnected lessons, and, unless the teacher was a particularly strong one, of not getting the desired results.

The work was found to have a tendency to be unbalanced, disconnected, and too much influenced by the teacher's special science interests. Even in the general-science course there was found to be not enough emphasis of the openness of the world of science. There

was need of a connecting thread which should give greater unity and balance and purpose to the work in the minds of both teacher and students.

A few agriculturists and science men then began to feel that the solution of both the agricultural and the science problems of the first high-school year lies in the agricultural general-science course. This was suggested as early as September, 1910, in an editorial in the Experiment Station Record.

By this combination of work the usefulness of scientific knowledge is emphasized. Such a course not only presents and teaches certain scientific facts, but it provides values for them. It gives an economic, as well as a cultural, motive for further scientific study. It relates the scientific facts taught to the life of man, to certain of his fundamental needs, and to the problems of a basic industry. The agricultural work furnishes a core about which are grouped in a vital way the fundamental conceptions of elementary general science. By the agricultural work the facts of general science are related and the course is given balance and purpose.

With regard to agriculture, a combination of agricultural and general-science work promises an equally good effect. The science work explains and dignifies the agricultural work. It early gives some familiarity with scientific methods and emphasizes the importance of investigational work and evidence.

Where a four-year agricultural course is given in the high school the pupil must in some way get considerable information concerning the elements of various sciences during the first high-school year. Special separate courses in different sciences during the first year will not serve the purpose, for he has not enough time to take several of them. He must either get them in a beginning agricultural class or in a general-science course. Why not combine the two? is a natural question. If a good beginning agriculture course can be arranged which is at the same time a good general-science course, the advantages are apparent.

Finally, it is rightly argued that for such students as do not go on with either agricultural or pure science studies, such a course serves as a valuable culture course. So much of agriculture as is embraced in this first-year course is needed by every boy and girl as a matter of general intelligence, information, and culture. Whatever their station in life and whatever their occupation, they should know at least this much as to the fundamental industry through which the materials of their daily food supply are produced. The agricultural general-science course gives an opportunity for the large number of students who do not go beyond the first year or so of the high school to get at least a glimpse into the great field of science and an introduction to its methods. To those students who do go on through the

high school, and perhaps to college, but who are specializing in the classics, or modern languages, or some subject other than science, it gives a survey of the elementary facts of several sciences, instead of limiting them to a scant semester or two of a single science.

Thus, it is argued, by using an agricultural general-science course we not only serve the educational purposes of first-year agriculture and first-year science to the best advantage, but we economize time, money, and effort. The same beginning course may be given to all first-year students, whatever studies they are to take later. Economy of time, materials, and teaching energy thus accompanies the most satisfactory form of instruction.

Such is the theory. And it is a reasonable one. But in actual practice, where agricultural general-science courses have been tried, some have been very unsatisfactory.

This has in most cases been due to no fault in the agricultural general-science idea, but in the way it has been worked out. Agriculture and general science have been combined, but with a poorly prepared outline. The agricultural basis for the work has itself lacked unity. The agricultural connecting thread has been weak and disconnected. The materials of the course have been too heterogeneous. There has not been a proper balance between the agricultural and the general-science phases of the work.

That an agricultural general-science course which satisfies all the demands of both first-year agriculture and first-year science is possible there is no doubt. That such a course may be so organized and presented that it shall have all the advantages claimed for it, without the weaknesses which have in most cases accompanied it, is equally true.

In California we believe that we have worked out an agricultural general-science course which does give both a suitable foundation for the agricultural work of later years and a proper introduction to the work of the special science courses of the high school.¹ In it, practical agriculture and scientific facts are constantly paralleled and balanced. Elementary facts of every high-school science are taught, and the sciences are constantly related one to the other. The outline of the work is adapted to practically any locality or high school. While definite, it permits great freedom in treatment to suit local conditions.

As a general outline for the work, the secondary agronomy outline given in Office of Experiment Stations Circular 77 has been adopted, but with many modifications. Though the circular recommends that

¹The course was first worked out by the writer and tested at the Oxnard high school, in 1909-10, a year before the publication of the editorial in the Experiment Station Record on first-year agriculture and general science. During the year 1910-11 it was still further improved, and tested by the writer at the Fresno (Cal.) high school. Since that time a number of California high schools have inaugurated courses modeled along the same lines, with satisfactory results.

the work of this outline be preceded by a botany course, this is neither necessary nor desirable, as it is used in the agricultural general-science work.

The outline was chosen as a basis for the work because it deals largely with plant growth and development. Since the growing of plants is the basis of agriculture, the study of plant life should naturally precede other agricultural study. The materials of first-year agricultural work, whether intended primarily as a foundation for the work which is to follow or merely as a unit of beginning agriculture, should center about the growth and development of plants and the study of their environment.

Even though we assume what is, though desirable, not always the case—that elementary agriculture has been taught in the grades either as agriculture or under the guise of nature study—yet a more thorough, scientific study of plant life and growth should be given during the first year of the high school than is possible in the elementary or grammar grades, with their limited equipment and inexperienced instructors. This is desirable not only because of the better equipment available in both the high-school laboratories and library, and the consequent clearer bringing out of the scientific basis of agriculture, but because of the possibility of greater thoroughness, through more frequent and longer recitation periods and the improved grade of instruction possible where the agricultural work is given by a trained scientific agriculturist.

I believe that the first-year work should be limited to plant growth and environment, omitting all animal study, except where directly connected with the plant study, as, for example, some study of insects as reproductive agencies and as aids in the fertilization of flowers, study of the earthworm and its work in soil formation, and so on. Only the most cursory attention should be given to farm implements; farm management, general horticulture, etc., must be almost ignored; for by thus limiting the first-year work entirely to the study of plant growth and environment, we are enabled to do more thorough work and to secure a better foundation for later courses.

I do not believe in the scattering of attention and energies so common in first-year work. There is abundant material and enough variety in the study of plants, of how they live and grow, of their struggle for existence, of the effect of the various environmental influences about them upon their development and crop yield, when this is accompanied, as it should be, by abundant field practicums, trips, and the growing of gardens or special crops.

But though the limiting of first-year agricultural work to a study of plant growth, development, and environment seems advisable, yet this does not mean that only purely agricultural and botanical facts shall be taught in the course. An outline for first-year agriculture,

based on plant life, may also furnish an ideal outline for general science work, giving opportunity for the teaching of the elementary facts and principles of geology, physics, chemistry, zoology, entomology, and physiography, as well as of botany, and while connecting and relating these sciences, preserving a suitable balance between them.

To show more clearly how such a first-year agricultural course may be made to serve the purposes indicated, I have prepared for a book now in press¹ an outline showing the arrangement of work as used now in a number of California high schools. This outline is divided into three parts, the first of which shows the modifications made in the agronomy outline in Office of Experiment Stations Circular 77, before mentioned, and, as elaborated, representing the agricultural aspect of the work. According to this outline, the composition of the plant is first taken up, and later, in order, plant structure, physiology, heredity, and environment, including light and heat, air, moisture, the soil, plant food, repressive agencies, etc.—all from the point of view of the agriculturist and practical farmer. The second part of the outline is made up of suggestions as to scientific facts and principles which may be given in connection with the course; that is, it represents the general-science aspect of the course. And the third part consists of suggestions as to experimental work in the laboratory and field, class demonstrations by the instructor, field trips, etc. The modifications in part one, and all of the second and third parts of the outline, were worked out, as has been said, in giving a first-year agricultural course in the high school, and the materials indicated were tested with different classes with very satisfactory results.

The work of each of the three parts of the outline may be compared to a strand of a rope—the three strands joining to form a strong, continuous whole. Each strand gives strength to and derives strength from the others. Each is of equal importance and equal dependence.

That this arrangement of work offers abundant opportunities for the study of plant growth, development, environment, and improvement, from the agricultural viewpoint, has been proved.

A wealth of interesting laboratory and field work is made possible by the topics of the course, and the work is such that it promises both a firm foundation for future work and a sure appeal to students' interests. Though at first thought the outline may seem to begin with topics beyond the ready comprehension of first-year high-school pupils, yet experience has proved that, treated in the right way, the essential facts as to plant composition and structure are readily understood by pupils of this grade. The eagerness and quick understanding which first-year pupils bring to a simple, clear, yet thoroughly scien-

¹ Hummel, W. G., and Hummel, B. B.: *Materials and methods in high-school agriculture.*

tific treatment of these and other topics, such as organic evolution, the struggle for existence, problems of plant improvement, etc., is most surprising to those who have had no experience in teaching them.

The rich opportunities offered for general science work are also evident. In studying plant composition, physical and chemical changes must be explained; the characteristics of the elements necessary for plants, their occurrence, preparation, properties, and importance should be brought out. The composition of water, its form and physical properties, may be taken up when discussing the water content of plants. The indestructibility of matter, the general topic of combustion, and many other facts of physics and chemistry may also be presented at this time.

In studying plant structure the study of the vegetative and the reproductive organs of the plant, the parts of a flower and the relation of certain insects to fertilization are subjects which crowd to the fore.

Plant physiology brings up the movement of plant juices, the joint action of physical and chemical agents, and a comparison of plant and animal physiology.

In studying plant heredity, organic evolution and the theory of descent may be taken up to any desired extent. The factors in organic evolution, natural selection, artificial selection, isolation, the theories of De Vries, Mendel, etc., offer a wealth of material. And examples of improvement in plants and study of typical illustrations add interest and vitality to it all.

Plant environment brings in a study of heat and light in an elementary way, and perhaps of color as well. The thermometer will also be studied at this time. Moisture as a part of the plant's environment brings up the subject of the mechanics of liquids, capillarity, and surface tension. The air as a part of the environment makes it necessary to study the atmosphere, the mechanics of gases, and the barometer. The study of plant foods introduces the composition of soils, plant food obtained from the air, from soils, and from fertilizers. Soil study, as a part of the study of plant environment, brings up the question of how soils are made, the chemical and physical properties of soils, agricultural geology, the geological study of soils, etc.

The study of the repressive agencies with which plants have to contend develops many scientific facts. Entomology must yield us information concerning the life history of injurious insects, their structure and development, collecting, classifying, etc. Bacteriology gives us information concerning certain plant diseases. It is necessary for organic evolution to explain plant competition and the struggle for existence. Physiography comes forward to explain climate as related to agriculture, the daily weather map, winds, the course of storms, etc. And chemistry must give us tests for soil acids and alkalis and information as to neutralizing agents.

In giving the course, two full periods per day should be allotted to the work. Yet even with two daily periods it may not be possible to cover as much ground as is desirable. Time may, however, be economized by increasing the number of demonstrations by the instructor or by individual pupils. Yet to secure the best results a generous number of exercises and practicums must of course be performed by each member of the class.

The class time may be divided between laboratory, class, and field work as seems best, though not less than one-third of the time should be given to practicum work of one kind or another. It is recommended that no textbook be required, since none at present available is adapted to the work. Several copies of some of the better high-school manuals should, however, be provided for class use, and the library equipment should include a wide range of agricultural books and bulletins dealing with the topics of the course.

The equipment should include, wherever possible, a greenhouse, or lath house, or both, for plant propagation and certain other work. Many of the materials and some of the apparatus of the biology, botany, chemistry, physics, and other science departments of the high school, together with some special agricultural equipment, as tools for gardening, soil sieves, soil thermometers, and so on, must also be provided. Much use can profitably be made of a lantern in connection with the lecture work, for illustrative purposes, but this is not counted as a part of the special equipment for this course, since it is used quite as much or more for many other high-school courses. Farms, local nurseries, etc., of course furnish much valuable illustrative material, as does also a school agricultural exhibit, after agricultural courses have gotten well under way and collections have been made. Sufficient land for gardens and demonstration plats should also be available in connection with the school. However, by utilizing home plats in individual home project work, the amount of school land necessary may be greatly reduced.

It will obviously be found impossible to treat in much detail the scientific facts and principles brought up in following out the general science aspect of the course, in addition to doing practical agricultural work. Such of them as seem most needed by the class in connection with present or as a preparation for future work should be studied in a thorough, if elementary, way, but the practical agricultural phases of the work and the attendant practicums and laboratory work must overbalance the purely scientific aspect of the work, and the agricultural value of a particular fact or experiment must be the guiding principle in the selection of the materials of the course.

Yet even the treatment of the strictly agricultural topics must necessarily be greatly limited. Only the fundamental principles and basic facts can be taken up under each topic. A general understand-

ing of the processes of plant growth and the conditions of its environment, together with an appreciation of the scientific basis underlying them, some little knowledge of a few special crops, a fair amount of deftness in laboratory and other practical exercises, ready and accurate observations, the formation of right ideas as to agriculture and country life, eagerness for future study of those subjects which help us to understand our environment, and preparation for the special work of science, domestic science, or more advanced agriculture—these such a course does give, and this is as much as should be expected from it.

III. WHAT RELATION SHOULD EXIST BETWEEN THE EXPERIMENT STATIONS AND THE SECONDARY SCHOOLS OF AGRICULTURE?

President A. M. SOULE, Athens, Ga.

The primary function of a secondary school is that of teaching. It is the workshop into which the youth from the public school comes to receive, in many instances, all the instruction possible before entering upon the exacting duties of life. Any institution upon which such a grave responsibility rests must ever keep in view the central reason for its existence, and emphasize and elaborate upon its scheme of instruction so as to give it something of cultural value, a broad vocational basis for service, and an adaptability to environmental conditions.

In order that the best teaching may be done, it is necessary from the modern point of view that an exposition of the fundamental principles or theories of a subject be made in the classroom, the applications of the classroom facts illustrated and exemplified in the laboratory, and their utility in practice demonstrated in the field or the workshop. To some this may appear altogether idealistic, yet it is possible for many of our secondary schools to attain this plane of instruction with infinite benefit to themselves and an entire transformation of the viewpoint of the students which they graduate. Any secondary school, therefore, especially where it attempts to emphasize vocational subjects, must have efficient laboratory facilities and equipment and a shop and farm in which to illustrate and bring home in the most emphatic manner possible the final purpose intended to be conveyed by the courses of instruction offered.

Provided the institution has the equipment indicated, it will immediately appear to many that it should take up experimental work. Those who advocate this probably have no very clear conception of what constitutes an experiment, much less an appreciation of what is meant by the word research in the limited application this word

has from the standpoint of the scientist. The facilities indicated above could not be construed as offering an opportunity for carrying on research of a high order or which might be correctly recognized as of an experimental character. While there have been thousands of so-called experiments made in the United States, most of these would probably fall into the class of simple demonstrations or illustrations of principles or facts already known. Research is something exceedingly difficult to define. There are few men capable of organizing and directing it, and those who have achieved the greatest success have been afforded means from State or philanthropic sources which have practically enabled the savant to withdraw himself into a specialized atmosphere and devote his energy to the problem selected for investigation.

At the present time, in my personal judgment, the secondary schools are not prepared and should not undertake experimental or research work. From this it should not be concluded that no effort should be made to develop the minds of the boys and girls and point out to them by demonstrations the possibilities which experimental investigation and research offer the competently trained individual. To this end it would be well for every secondary school to endeavor to carry on a variety of experimental demonstrations. These may properly fall within four classes:

(A) Such simple experiments as are calculated to illustrate the principles of the various courses of instruction. For instance, if a boy be required to test the milk from cows for a sufficient length of time to illustrate the principle of individuality in animals, he will be infinitely more impressed and developed by this experience than through months of classroom instruction alone. Tests of this kind are of the utmost importance to the student, and they should be encouraged as much as possible.

(B) Demonstrations of educational value to the community should be inaugurated. They will of course be useful to the school, for every school, to be successful, must have a clientele of its own, and it should be the object and purpose of its board of trustees and teachers to bring it as intimately in touch with its adult constituency as possible. A good demonstration to organize in a rural community would be one setting forth the effects of seed selection with such crops as corn and cotton. It would cost very little to do some work of this character, and yet its results would be highly beneficial to all the interests concerned.

(C) Every school should attempt to bring new facts to the attention of its student body and its home community. Science is now making such revolutionary progress that the truth of to-day is disproved to-morrow, while new principles of practice as applied to mechanics or agriculture are found out almost daily. The interest

of all is greatly stimulated by constant touch with the leaders in all fields of scientific activity, and therefore what may be termed the extension experiment should be emphasized whenever possible. For instance, a test might be undertaken in a given community to show the importance and economy of applying calcium nitrate as compared with the forms of nitrogen which have previously been used for fertilizing purposes.

(D) Cooperative experimental work with the State experiment station may be carried on in some instances to advantage. This work does not originate in the school, but is intended to show the students and the people of the locality the benefits to be derived from modifying the practices followed in some respects. For instance, in one State with which the writer is acquainted there are a number of secondary schools. These schools are located on land varying widely in type. The State uses considerable quantities of commercial fertilizer. The college of agriculture in this State is engaged in cooperation with other agencies in carrying on a physical-chemical soil survey, so that the deficiencies of these various type soils may be ascertained, supplementary fertilizers required determined with some degree of accuracy, and the best methods of crop rotation calculated to build up these soils established. This is a most important constructive piece of work. Carrying it on in association with these schools is a matter of momentous concern, not only to the boys and girls, but to the people in the counties contiguous to the secondary schools in question. This character of work, from one point of view, may be regarded as of an experimental nature and involving in some respects the principles of a research investigation. Yet in its larger applications it is intensely practical, and the schools in question would in the opinion of the writer be justified in devoting some of their energy and a small amount of their resources to the furtherance of a cooperative project of this character. The difference between this kind of work, however, and the demonstrations referred to above lies in the fact that it has been conceived on a State-wide basis, contains an element of true research, and is presumably directed by men who have opportunities and facilities at their command which a secondary school can hardly hope to enjoy for many years to come. The school of itself could therefore not well undertake work of this character with satisfaction, and yet an investigation of this type is entirely justifiable, though probably constituting quite as elaborate a piece of cooperative work as any secondary school would be justified in undertaking with the experiment station. To impose upon these institutions the duties and responsibilities of a substation would therefore not be desirable, for unless there are two organizations within the institution the chances are that the funds intended for experimental work would be used to promote the ends of instruction departments, or vice versa, depending largely on the capacity and skill of the men

placed at the head of the teaching and experimental departments, respectively.

Those who have had large experience in experiment station work realize how very difficult it is to carry on investigations satisfactorily, except under the most favorable conditions. A large equipment is required to begin with. Men of fine attainment and unusual training must be secured, while a first-class library is absolutely necessary. The experience of experiment station workers in the United States bears out the statement that the greatest success has been attained when work of this character has been associated with great universities or other educational institutions which have a fairly liberal endowment, an abundance of scientific apparatus, and are pervaded by that peculiar atmosphere which scholarly men alone create. To isolate experimental work and workers under conditions where petty jealousies and strife enter into their problems is suicidal. Therefore, at best the secondary school should only act as a coordinating agency with the State experiment station, and it is unreasonable to expect an institution of this kind to organize and promote research of a highly specialized type. As a matter of fact, secondary schools of agriculture should be much more closely correlated with the college of agriculture than the experiment station. Their main function as stated at the outset of this paper is that of teaching, and this must be preserved, if their integrity is to be maintained and they are to serve the purpose for which they were established in a manner satisfactory to all the interests concerned.

From the point of view of the writer, there is an error in the Page Bill as it now stands which should be modified, if this measure is to be given serious consideration in the immediate future. Reference is made to the proposal to establish a substation in connection with every secondary school. Personally, I am not opposed to the secondary schools receiving supplementary appropriations from the Federal Government for the maintenance and more complete organization of their work, but if funds are appropriated to these institutions let it be for demonstrations of the type and character outlined in this paper. Work of this kind can be carried on successfully and with the hope of achieving results of some considerable value to the constituency these schools are intended to serve. Experimental work under the conditions surrounding the average secondary school is not likely to prosper. The enthusiasm of some friends of agricultural education and their lack of acquaintance with the true significance and application of the term experiment are probably accountable for the error in question. As friends of secondary education and as believers in the mission and purpose of the secondary agricultural and vocational school let us not as a body of clear thinking and patriotic citizens ask or expect them to undertake a service for which they are not prepared.

IV. THE USE OF LAND IN CONNECTION WITH AGRICULTURAL TEACHING.

(Report of committee of the American Association for the Advancement of Agricultural Teaching: R. W. Stimson, Boston, Mass., chairman; C. G. Selvig, Crookston, Minn.; G. A. Works, Madison, Wis.; F. R. Crane, St. Paul, Minn.)

DIVISIONS OF THE REPORT.

Upon the suggestion of Prof. K. L. Hatch, president of this association, Mr. C. G. Selvig, of Crookston, Minn., was assigned the portion of this report dealing with the use of land in connection with agricultural teaching at the special secondary agricultural schools; Messrs. Crane and Works were assigned the parts dealing with the use of land in connection with the teaching of agriculture by elementary schools and the colleges; to the chairman, of the committee was assigned the part dealing with the use of land by high schools teaching agriculture.

Unfortunately, Mr. Crane changed his field of service and has been unable to give very much attention to the investigation. Moreover, Prof. Works found that his interests lay so largely in other directions that he did not feel like devoting the necessary time and labor to the preparation of his part of the report. The chairman of the committee has, therefore, extended his attention to the use of land in connection with elementary schools. He has not attempted to make an exhaustive survey, but will submit a few significant items of information which were received.

(a) IN SPECIAL AGRICULTURAL SCHOOLS.

By C. G. SELVIG,

Superintendent of Northwest School of Agriculture and Experiment Station, Crookston, Minn.

This part of the report concerns itself with special schools of agriculture, embracing—

1. Congressional district agricultural schools.
2. County schools of agriculture.
3. State and private agricultural schools with indeterminate territory, including—
 - (a) Schools located at the agricultural college.
 - (b) Schools located apart from the agricultural college.

These schools differ greatly in their organization, support, the kind of work offered, equipment, and the amount of land used. They have one main aim in general, and that is to teach practical agricultural practices to the young men who enroll. To secure data for this report, an inquiry was sent out to the schools as reported in Circular No. 97 (revised), Office of Experiment Stations. A careful

perusal of bulletins and announcements sent out by these schools and the information given in reply to the inquiry show the greatest diversity in their activities.

One thing may be noted at this time, and that is the great increase in the number of such special schools. The first one is scarcely 25 years old. This is the School of Agriculture at St. Anthony Park, St. Paul, Minn., which was organized in 1888. Nearly all are dormitory schools. The terms vary in length from six months of the year to continuous sessions during the year. Most of the schools have either six months' or nine months' terms. Courses include the general agricultural subjects. The emphasis in instruction is placed upon the practical application of agricultural principles to actual farm practice.

THE AIM IN THE USE OF LAND.

Primarily, the aim of these schools in the use of land is demonstrational, and not experimental. In most cases the land is used as a basis for laboratory work, but the main idea is to have the school farm show what can be done under the conditions prevalent in the part of the State where the school is located. Many of the schools report a limited amount of experimental work in addition to the demonstration work.

The school farms which are located at these institutions vary in size from 3 acres to several hundred acres. In the case of most of the larger farms, the major portion of the land is used for general farming work.

Some of the schools report part-time work on the school farm by the students themselves. This is not, however, generally done at the present time. Most of the labor used on these farms is hired. In many cases the students are hired to do the work, a part of it during the school year, but mostly when there is no school in session.

The replies to the inquiry sent out indicate that there is practically no individual plot work done by the students. In most cases the schools are in session during the winter. In the case of the schools where the term lasts six months, the idea is that the practical work of applying knowledge gained in school shall be done on the home farm of the students.

A more detailed summary of the information gained from the replies to the inquiry and from the bulletins published by these schools is appended as a part of this report. (See Appendix A.)

From this investigation there come certain conclusions as to the use of land in connection with special schools of this kind, based upon the present practices of the schools. It would be exceedingly difficult, if not entirely impossible, to lay down any specific rules that should apply generally. This comes because of the great diversity

in organization, the great difference in support, and in the problems that should be met in the different States and at the various schools. It is also unnecessary that there be any particular uniformity. These special schools have a definite problem to solve. They are so organized that they may adapt themselves to the needs of their particular sections of the country. All this report can attempt to do is to point out what is being done and to present advanced lines of effort that seem feasible and practicable. This part of the report of your committee is made without conference with the other members of the committee, whom it was found impossible to join; so they may be entirely absolved from its deficiencies.

LAND FOR DEMONSTRATION PURPOSES.

Most of these schools have a tract of land large enough to work out and illustrate some system of farming, as well as demonstrate ordinary farm practices. Truck farming, fruit farming, dairy farming, and other types of farming are shown. On these school farms there should be carried out a thoroughgoing farm business in actual practice which would give the boys a thoroughgoing, practical farm training. The land should serve as a model farm for both the boys who attend the school to study and for the farmers who visit the farm to inspect.

A certain minimum of land is demanded for this purpose. Most of the schools have this minimum of land already in use and are using the land in part or as a whole for the purpose mentioned.

COMMERCIAL FARM RECORDS.

The farm should be run on a strictly commercial basis, excepting such plats and parts as are used for experimental purposes. These should be kept separate as far as the accounting system is concerned. It is extremely important that statistics be furnished regarding the cost of all farm operations in each of the different sections in the State. The school of agriculture at Canton, N. Y., is doing this work in an intensely valuable way.

DEMONSTRATION WORK.

On the school farm accepted facts in agricultural practice should be tried out in a demonstrational way. At the Northwest School of Agriculture, at Crookston, Minn., the farm embraces 640 acres of Red River Valley prairie land. About one-tenth of the farm at the present time is used for demonstrational work on plats. While the demonstrations that are being conducted there would not fit in in other localities, the nature of the work done there may be of value

in showing the extent of the work. In Appendix B are projects that other schools are trying. There is some experiment work mixed in with this other work of a demonstrational nature, but, in general, the work is testing under farm conditions the old as well as the new methods promoted by the experiment-station workers.

At Crookston it is sought to build up a body of knowledge gained from these demonstrations which will be of value to the farmers of this section of Minnesota. (See Appendix B.) This knowledge will become also a part of the instruction work in the classrooms of the school. This knowledge and direct personal observation of the farm by the students will enable them to meet successfully the same problems on their home farms. It is a definite function of these special schools to conduct demonstrations that are of the greatest importance to their respective sections.

GENERAL FARM PRACTICE.

At Crookston the remainder of the farm is used to demonstrate on the larger fields that, commercially, crop rotation, the use of pure-bred seed, the proper cultural methods, and other accepted practices, pay. There are on this particular farm also several kinds of drainage; so that problem is being investigated. The production of pure-bred seed and stock are profitable business enterprises. The kind of work may be different in other sections of the country. Aside from the direct demonstrational work for which the land is used, there should be the greatest emphasis placed upon the incidental and often as important work that is made possible through the best possible use of the land. The farm may be the place where the best pure-bred seed for that section is produced. The same may be done in fruit growing, in gardening, and in forestry. Raw material for various feeding combinations for the stock should be grown on the farm and used in feeding the farm hand and poultry. Feeding stock economically is the largest factor in successful farming in most parts of the country. It is the place where farm practices fail oftener than at any other.

PART-TIME WORK.

The students should be required to have part-time work on the school farm. This will give them a closer acquaintance with the demonstration plats, the general farm fields, the farm records, the feeding work of various kinds, the practical use of machinery, and the ordinary farm operations. Of necessity, if the school is in session mostly during the winter season, the work on the school farm will be reduced to a minimum. There is time for some of this work, however, and it should be required.

"SUMMER PRACTICUM" WORK.

These special schools of agriculture do not, as a rule, allow as much time for actual work on the school farm as should be done by the students. Therefore some system whereby the students can carry out selected projects on their home farms is necessary. Several schools are doing work along this line. It is called "summer practicum" work at the Northwest School of Agriculture, Crookston. The inquiry sent out elicited no definite information regarding the nature and scope of this work at other schools. To illustrate what is meant, I take the liberty of describing the summer work at the Crookston school. I believe it is a vital part of the work of this school and will become an invaluable part of the training offered by the special schools. In this way the winter months are spent in getting in touch with the best agricultural methods, while during the time when there are no sessions the most successful farm methods are put into daily use and careful data are taken to be used the following term of school.

In the 1912 bulletin of the Northwest School of Agriculture the following paragraph was included under the title of "Summer practicums":

Summer practicum work is a part of the regular school course, and must be taken by all C and B boys during the two summers intervening between the freshman and senior years. The work consists of practical work on their home farms in following up studies taken at the school during the winter. The projects selected must be submitted to the superintendent for approval before February 1. Regular reports of the progress of the summer work are required each month. Each student will be visited at least once during the summer by some one connected with the school, who will give suggestions, note progress, and report on the success being attained. Credits in this work are required for graduation from the school.

Early in the spring of 1912 a list of projects was made and minimum requirements governing each was formulated. (See Appendix C.) The first and second year students were given the privilege of selecting one or more of these projects for home work. As the work done in 1912 was the first attempted along that line by this institution, difficulties developed that will have to be remedied. In the first place, a choice of too many projects was offered. It was impossible to have all of the projects on the list of equal importance. Seventy-six projects were selected by 62 boys, more than one each, of 18 different kinds of work. Monthly reports were received from the 62 boys in all the projects where it was necessary to receive monthly reports. In all cases a preliminary and a final report were received. The projects planned were comprehensive enough to discover if the student had acquired a mastery of the principles that underlaid that particular work and knew what was expected of him. The success or the failure of the work depended upon himself alone.

although the projects were under the supervision of the school during the summer season. In this work were united theory, observation, and practice. The summer practicum work also served the very important work of bringing the school and the farmers of various communities together. It served a further purpose of enlarging considerably the areas of land indirectly supervised by the school. The summer practicum work put responsibility upon the individual students which they can not be made to assume in doing part-time work at the school, even if they have individual plats there. Caring for individual plats would not furnish the training in actual management afforded by the home work. When the summer practicum work is more fully developed it should become demonstration work of the best possible kind on actual farms, because from the nature of this work, properly done, it should have a large value in that direction. When the neighbor comes to John's home and sees there the work John is carrying out during the summer as a part of his agricultural school course, he is not only going to watch it closely, but profit by every step that means progress. This work is not the school professor's work, but it is John's work, done under his own intelligent management, because he knows from his school work and from his knowledge of successful farm practice that there is only one way to do that work right.

I regard this summer work as a very important part of the general plan of the use of land in connection with these special schools. It offers an unlimited field of effort along lines that will bring valuable results to the students and the farmers, and will increase the usefulness of the school manyfold.

"POSTGRADUATE PRACTICUM" WORK.

In this connection I wish to mention briefly what will logically follow this summer practicum work. The boys who attend these special schools become actual farmers after leaving school. In Minnesota the graduates of schools of agriculture are counted among the most successful farmers of the State, the leaders in their communities. They can be organized into associations of farmers' clubs, and will continue to try out projects on their farms after they have left school, and report annually at their meetings their experiences, the cultural methods that succeed best, statement of the cost of production, the results with their stock, and so on. These annual meetings held at the school every year would prove to be of the greatest value. This postgraduate practicum work will be a means of carrying out the final step in the training for successful farming begun at the school. The truest justification of these special schools of agriculture comes when these institutions train such rural leaders.

WORK WITH LAND OUTSIDE THE SCHOOL.

Another line of work which special schools of agriculture already have taken up to a large extent, and which must become each year of increasing importance, is their work with actual farmers who are not enrolled in the schools. This will take several directions. It may be in actual work of planning farms, including starting rotations, or in live stock and drainage work, as the need may be. Demonstration plats may be run on the farms by the farmers themselves, using the suggestions of the corps of instructors connected with the agricultural school. These demonstrations will assist in introducing various new crops, in showing what new methods will accomplish, or in keeping a system of farm accounts. This may be considered extension work and be regarded as set apart from the work of the school. To my mind it would be a mistake to regard it in that way. The most vital thing in connection with these special schools of agriculture is that they come into close touch with the actual farmer on his farm and aid him in solving his problems as they arise. Only in this way can they keep close to the farmers themselves. Only in this way can they serve the purposes for which the schools were established.

(b) IN HIGH SCHOOLS.

By RUPUS W. STIMSON,

In charge of Vocational Agricultural Education, Massachusetts Board of Education, Boston, Mass.

MAGNITUDE OF MOVEMENT.

Members of this association are undoubtedly familiar with the publication issued annually in recent years by the United States Department of Agriculture, Office of Experiment Stations, giving the institutions of all grades, both private and public, which are teaching agriculture in the United States. Those present will probably recall the summary given at the last annual convention by Mr. A. C. Monahan, assistant in rural education, the United States Bureau of Education. Mr. Monahan said that figures taken from the reports submitted by schools teaching agriculture showed that the United States then contained more than 100 special agricultural schools of secondary grade, located in 17 different States, by which the schools were supported in whole or in part. In 1910, he said, agriculture was taught as a separate subject in more or less complete courses to more than 37,000 pupils in 1,800 public and 140 private high schools.

AUTHORITIES AND FORM OF INQUIRY.

In seeking information for this report inquiries were addressed to most of the State superintendents of public instruction and presidents or deans of the agricultural colleges. Each was asked to say what high schools, if any, had made the best use of land in connection with the teaching of agriculture during the past season, (1) home farm land, (2) land at the school. With the request for information were sent copies of a sheet giving the organization of this association and its purposes, also a sample of the form of questionnaire (see Appendix E) which was to be sent to the individual instructors in charge of the agricultural teaching in high schools whose names might be given.

STATES REPORTING USE OF LAND.

Twenty-three States have reported the use of land at one or more of their schools. The questionnaire was filled out more or less fully and returned by 22 States. Fifty-six replies, all told, were received, as follows; the number of replies from each State is indicated: California, 1; Illinois, 1; Iowa, 4; Maine, 4; Maryland, 1; Massachusetts¹; Michigan, 2; Minnesota, 9; Missouri, 1; Nebraska, 1; New Hampshire, 3; New York, 2; North Carolina, 2; North Dakota, 3; Ohio, 9; Pennsylvania, 1; South Carolina, 2; Texas, 2; Vermont, 1; Virginia, 4; Washington, 2; Wisconsin, 1.

ONTARIO AND QUEBEC.

The principal of Macdonald College, Quebec, Canada, reported that no use of land is yet being made in connection with the teaching of agriculture in high schools in the Province of Quebec. The deputy minister of the Ontario Department of Agriculture, Toronto, had the following to say:

I take it you mean the best use from the standpoint of developing interest in agriculture. Looking at it from this standpoint, I fear there is little in this Province which would be of assistance to you. Our district representatives, of whom we have now over 30 located at different points throughout the Province, conduct in many cases experimental plots covering an acre or less. These experiments have in most cases been very successful as experiments, but I do not know that they have had a very great effect in developing the interest in agriculture, particularly in the schools. Our work in the high schools outside the usual curriculum has consisted more in a course of six to eight weeks in the wintertime, supplemented in many cases by short courses of two or three days for the adult farmers, including those who do not attend school. At these short courses high-class stock is used for demonstration purposes. * * * I might add that the schools come under the Department of Education, and in addition to the work which is done by the Department of Agriculture in a general

¹ Conditions personally known to the writer.

outside way, the Department of Education is doing a great deal to develop interest in agriculture by means of school gardens, charts, object lessons, special training of teachers, etc.

SCHOOL LAND: DEMONSTRATION AND EXPERIMENT.

Where high-school land is reported as being used, in most cases it is being used for experimental or demonstration purposes, rather than for purposes strictly productive. Many schools have so recently undertaken their work that they have little in the way of results to report. The president of the North Dakota Agricultural College, for example, says:

Our agricultural high schools only began during the month of September, and as yet no work has been done on the agricultural experimental plots except to prepare the ground for next year's crop.

Dean Davenport, of the College of Agriculture, University of Illinois, wrote:

The high school at McNabb, Putnam County, has 24 acres of ground, and in the immediate neighborhood is one of our experimental fields. This is the first school of the kind to be located out in the open country, and I think should be mentioned as an ideal high school.

Unfortunately, the effort to secure information as to the use of the McNabb High School land was not successful.

SIZE OF SCHOOL PLATS.

The size of the experimental or demonstration plats varies from one-tenth acre up to 2 or 3 acres. Among the things shown the following were mentioned: Adaptation of different crops to the same soil conditions; effect of application of different fertilizers; variety tests of oats, potatoes with and without treatment for scab; grasses, wheat, legumes, corn; quantity of seed per acre for best yield, seed treated and untreated for smut; variety tests for yield per acre; effect of different depths of sowing; alfalfa growing with and without inoculation; soja beans, velvet beans, peanuts, cotton; rotation of crops; comparative effects of manures and commercial fertilizers on various truck crops; cover crops; effects of the use of lime; hothouse crops; orcharding.

PROFIT AND PROFIT SHARING IN CERTAIN CASES.

In a case now and then crops are grown for profit. In some cases the pupils have all the profit, in others the school has it, in others the profit is shared between the school and the pupils.

USE OF OTHER THAN SCHOOL LAND.

Twenty-two high schools reported agricultural production on home farm land or on other land apart from the school premises, with

more or less attention paid by the agricultural instructors to the home enterprises of their pupils. Following is the list:

- | | |
|---|---|
| Amaly Union High School, Sebastopol, Cal. (adjacent to school owned by district). | Willmar High School, Willmar, Minn. |
| Cedron School, Natchitoches Parish, La. | Maryville, Mo. (corn-growing contests). |
| Skowhegan High School, Skowhegan, Me. (home land and other land). | Hopkinton High School, Contoocook, N. H. |
| Madawaska Training School, Fort Kent, Me. | Grafton High School, Grafton, N. Dak. |
| Agricultural High School, Sparks, Md. | Crooksville High School, Crooksville, Ohio. |
| Hopkins Academy, Hadley, Mass. | Bedford Village High School, Bedford, Ohio. |
| Harwich High School, Harwich, Mass. | Waterford Borough and Township High School, Waterford, Pa. |
| Smith Agricultural School, Northampton, Mass. | Farragut School, Concord, Tenn. |
| Northboro High School, Northboro, Mass. | Alford Academy, Burkeville, Tex. (corn club). |
| North Easton High School, North Easton, Mass. | Chester Agricultural High School, Chester, Va. (work at home encouraged). |
| Petersham High School, Petersham, Mass. | Ellsworth High School, Ellsworth, Wis. |
| Howard Lake High School, Howard Lake, Minn. | |

CORRELATION OF STUDY AND HOME WORK RARE.

An effort, as you will see from the questionnaire, was made to ascertain how much of the agricultural instruction grew out of the actual home needs of the pupils or was such as to be directly applicable thereto, and how much of it consisted of the teaching of agriculture in general. Rarely has any attention apparently been given to the direct correlation of the home work of the pupils and their classroom instruction. One instructor writes:

All members of the class do some home work and report each month in a written thesis. I regard this as a valuable part of the year's work. It is accepted at the university (California) on the same footing as any other regular study.

CASES OF SYSTEMATIC SUMMER SUPERVISION.

In answer to the question as to how often during term time and how often in summer the instructor supervised the home work, no replies were given. The general question, Does the agricultural instructor supervise this home-farm productive work? found affirmative answers. Sometimes the instructors report that they supervise fortnightly during term time and monthly during the summer. Usually, however, there is no summer supervision, and sometimes not even one visit to the home of the pupil for studying at first-hand the pupil's needs.

The most systematic supervision of home work is found in such cases as that of Virginia, where the instructor serves in a double capacity as teacher of the pupils who come to the school and as

demonstration agent among adult farmers; and in Massachusetts, where no vocational agricultural training may receive State aid which does not include the close correlation of classroom instruction with productive farming on the home land of the pupils and the systematic supervision of the home-farm work by the instructor from March through the summer until the end of November. (The Massachusetts agricultural instructors take their vacations in the dormant months of winter.) In Massachusetts the formal classroom instruction covers about four spring months and about two months in the fall. Supervision during those months of the home-farm work is less frequent than during the summer. The instructor's primary business in the summer is to keep in the closest possible touch with his pupils in their home work, and the frequency with which the instructor visits his pupils is determined chiefly by the distance which he has to travel. One instructor rides a circuit of between 50 and 60 miles from farm to farm among his pupils; another rides a circuit of over 40 miles. The shortest circuit is above 30.

CORRELATION AND SUPERVISION DESIRABLE.

It is now and then stated among the remarks submitted with the questionnaires that more home work, and closer supervision of that home work by the agricultural instructors, would greatly enrich the values of the training and the interest of the pupils in their instruction. Some who have never done anything of the sort express a hope that they may soon undertake a closer correlation of their classroom instruction and the home-farm work of their pupils, giving to that work the impetus of their personal enthusiasm and of their close and intelligent supervision.

PRIZES AS INCENTIVES.

In a number of cases reliance appears to have been placed on the offering of prizes as incentives to good home-farm work. Here the work is sometimes so organized that committees of responsible citizens undertake to inspect, and vouch for, the honesty and high quality of the work and results of the home enterprises. On the whole, there appears to be good evidence that prizes are of much assistance, whether the supervision of the home-farm work of pupils be carried on by committees of citizens or by the agricultural instructors. In Massachusetts, for example, 32 of the incorporated agricultural societies of the State have this year had, and will hereafter receive, State grants of \$200 each for prizes at the fall fairs, on animals, farm crops, fruit and vegetables grown by the exhibitors, and on general excellence in stock judging. The stock-judging premiums were keenly contested for. The prizes at the local fairs were usually: First, \$15 in gold; second, \$10; third, \$5. The Brockton Fair

Association put up \$200 in scholarships to be competed for by the winners of the local contests. One hundred and eleven boys took part in the local contests and fifteen boys entered the final contest at Brockton. The boys from the Hadley (Mass.) School won \$243 in prizes, besides a trip to Washington, D. C., won by one of the boys. Letters which were received show that local contests leading to some big contest in a State and some big prize there won, or to a trip to Washington, have added a decided zest to the agricultural training of both boys and girls.

SCHOOL LAND SOMETIMES DESIRABLE.

The United States Department of Agriculture was without funds for field work the past summer, and Mr. Crosby was unable to contribute data for this part of our report. From Mr. A. C. Monahan, of the Bureau of Education, the following very interesting accounts have been received:

It is impossible for me to say what school is making the best use of land for instructional purposes, but I like the plan in use at the Concord (Tenn.) Agricultural School for an institution working under the same conditions as that school. The pupils are all day pupils and those taking agriculture follow a scheme somewhat similar to the home-project plan, which you are advocating in Massachusetts. The school ground itself (12 acres) is divided between a playground and a demonstration plot. The principal's home is located on the school grounds. About 6 acres are used for gardens. On this land is carried out a series of demonstrations to show the merits of different methods of cultivation and fertilization.

The Cedron School in Natchitoches Parish, La., is making good use of its land. Conditions are very much different from those in Tennessee. The school has an enrollment of about 105 pupils in all grades from the first to the eighth, with boys and girls from 5 to 18 years of age. The school garden is comparatively small. It is managed as a common garden, no pupil owning any special part of it, but all work together upon the garden as a whole. It is made a model in every respect, and it is intended to teach the boys and girls, and the community as well, through this garden the best methods of cultivation. In the few years that the school has been in existence the garden has been the earliest in the community, has the greatest variety of vegetables, and vegetables of the best quality. Hotbeds are managed in connection with the school work and thousands of early plants are distributed free to pupils to take home to their home gardens. In addition to this work on the school grounds by the boys and girls under the direction of the principal (Mr. Bott), the children are organized into tomato, pig, and corn clubs; the tomatoes, pigs, and corn being raised at their homes. A canning establishment has been erected beside the school building as a community cooperative movement, with the principal of the school as its president. The motive for its establishment was to find an outlet for the vegetables raised by the school children, both on the school property and on their home land. It is, however, canning vegetables of all sorts for the entire community. This year it will put up and market at least 50,000 pounds, netting the community more than \$2,000. It is 10 miles to the nearest railroad; so that such a community enterprise was badly needed.

SCHOOL LAND NOT INDISPENSABLE.

Sometimes it has been thought that agriculture can only be taught successfully where the school itself has land and live stock, each closely approximating the ideal of its kind. It may be of interest to

members of this association to know that the winner of the first prize, \$150, at Brockton, Mass., and the winner there of the second prize, \$50, in stock judging, were from a high school which does not own a head of live stock of any description. The training of these boys for the event was had by going from farm to farm and scoring the best animals found in the neighborhood of the school, also by a trip to the agricultural college, where excellent types of the different breeds of live stock to be judged were to be found. Substantial prizes were also won by pupils trained in agricultural classes at high schools which do not own or operate a foot of cultivated land.

ECONOMIC RETURNS.

The effort to secure information as to the profit of the individual pupils from the working of land other than school land was largely unavailing. The Madawaska Training School, Fort Kent, Me., reported returns not all in, but so far the highest net profit this year, \$5.10. The profits are sometimes suggested, when not stated in specific figures. For example, the Savannah High School, Savannah, Mo., reported as follows:

The work we have done with land has been in connection with a 9-acre tract, which we rented. The first year some of the boys of the class did the work; the second year (the present year) we had the work done by a man. We have directed the work and have used any materials we needed from the land. Our work has been confined chiefly to seed corn, seed oats, clover, millet, potatoes, and alfalfa. The profits have gone to the owner of the land and to those who did the work.

MASSACHUSETTS RESULTS.

By net profit, of course, is meant profit after the pupil had paid himself for his own labor and had met all other expenses in connection with his crop or crops. The highest net profit for 1911-12 in Massachusetts was \$270.24. This pupil had paid himself \$109.02 for labor and had paid others of his family for labor, use of land, etc., \$771.49. The total income of the family from his home project, which consisted of the handling of 12 dairy cows from November 7 to June 7, and which had been carefully studied at the school and supervised by the agricultural instructor, was \$1,150.75. In addition this boy, 18 years of age, was allowed by his father for other farm work done at home \$200. The boy's income from farm work alone, therefore, for the school period covered by the report, was \$579.26. This is one of the best examples of the combination of *earning and learning* in the carrying out of the Massachusetts plan of "part-time" training in agriculture which was discussed before this association a year ago. (See, also, above, p. 34.) The least favorable total this year was \$7 from a one-eighth acre garden, immaculately kept, but so carefully kept that the labor cost, in spite of the instructor's

best advice, ran up far too high for economic production. Some of the figures were radically reduced by crop failure due to unseasonable frosts, drought, or blight. One boy's garden was cut back three times by killing frosts. Appendix D gives items taken from the accounts of 5 boys from each of five representative points in Massachusetts where this plan of training has been in operation the past season. All but 3 of these boys showed earnings from farm work running into three figures. Two earned over \$300, 12 earned over \$200. Of the 3 that fall under \$100, 1 earned \$95.10; another, \$64.90; and the third, \$58.47. The total farm earnings of the 25 pupils exceeded \$5,000.

VIRGINIA METHODS AND RESULTS.

Some of the returns sent in, apart from the questionnaire blank, cover both high-school and elementary-school training. On the whole, however, the following letter from J. D. Eggleston, State superintendent of public instruction of Virginia, bears perhaps more closely on high-school training than on elementary, and is therefore here given:

First. We have organized in 45 out of the 100 counties corn clubs composed of schoolboys ranging from 10 to 18 years of age. We have about 2,500 boys in these clubs.

We have in each of these counties a man called the "demonstration agent," whose business it is to assist the adult farmer or any member of our boys' corn club, who desires to be shown how to raise better crops of corn and grass. The adult farmer uses as much of his own land as he pleases in following the directions of the demonstration agent.

Each boy has 1 acre on his father's farm; if he has been a member of the corn club for more than one year, he has his acre of corn and also an acre of grass. He works strictly under the eye of the demonstration agent, and the agreement with the father is that the crop belongs to the boy, as we do not desire the boy to be exploited, and we wish to teach him that phase of citizenship which is expressed in terms of commerce.

We have also 11 agricultural schools; four years ago we had 2; we hope to add 1 or 2 to the list each year, and we are arranging in these schools, and have already arranged in 5 of them, so that the teacher of agriculture at the school shall also be the demonstration agent in the county in which the school is situated.

Through a cooperative arrangement with the United States Department of Agriculture, the State of Virginia, the State board of education, and the local educational authorities, the program of work for the demonstration agent is agreed upon. For example, at the agricultural school in Nansemond County the instructor in agriculture at the school devotes three days of the week to the school farm and the agricultural work at the school; and three days of the week in the county, showing the farmers and the boys on their farms how to improve agricultural production.

We have the same plan at the Nottoway County High School, situated at Burkeville, Va., and the same plan will be started at three other schools this fall. The plan has worked admirably in Nansemond County and in Nottoway County, and has helped to popularize schools to a great extent.

It is now a common thing for farmers to come to the schools to have seed tested, to seek advice on all sorts of matters pertaining to the farm, and to ask for the services

of the demonstration agent on their farms. You can imagine the hold that this gives the school upon the community within a radius of 6 to 10 miles and even farther.

The instructor in agriculture in the Nansmond Agricultural School last session probably paid back to the farmers three or four times the amount of his salary by showing them how to eliminate hog cholera, which had been "rife" in that county for years. He has completely eliminated it.

This does not include the excellent work that he has done in increasing corn production, cotton production, trucking, and the raising of grass; and I may say in this connection that where this demonstration work is being done, the increase in corn per acre has been phenomenal. The same may be said of grass, and, of course, the teaching will be extended to other farm produce. We had to begin with what we thought was the easiest thing to take hold of.

Second. Our idea here is that the best use that can be made of the school land or school farm is to use it as a demonstration plot to show what the land will produce, and while using it in this way to use these materials as the proper subjects upon which the children may concentrate their self-activities.

You can see, for example, that any amount of arithmetic of the best kind can be gotten through school farm work. We require accurate accounts of outgoing and incoming; we require that the account be balanced at the end of the crop; we require that the boy shall, at every step, describe clearly what he is doing, and why; and we thus get excellent materials for the study of arithmetic, oral and written language, writing, spelling, etc.

It seems to me to be proper that a certain amount of the school farm work shall be done by the children for the school. I mean by this that the products to a certain extent shall accrue to the common fund in this miniature democracy, and that the funds from the sale of these products shall, with the consent of the children, be used for the enrichment of the democracy; as, for example, for library books, for pictures, and for other purposes of improving the democratic environment.

Beyond this, the children should receive pay for their labor; and if they do not, the management of the school becomes autocratic and the child is exploited, which is absolutely foreign and repulsive to democratic ideals.

The child is a citizen in the making and the teacher is the citizen maker. The school is the atmosphere for the growth of democratic ideals. The citizen is not complete who does not know the value of labor and who does not receive the proper return for his labor.

I can not state too strongly that I believe that the best place to teach agriculture is on the farm, and that it will not cost any more money and will produce much more satisfactory results in every way if we have the boy apply the theory, not at the school, but on the farm where he is likely to make his own living in the future.

I need not say to you that one of the great handicaps to the teaching of agriculture in high schools is that it tends to become a purely academic routine; and a healthy, energetic boy becomes utterly disgusted with studying about agriculture and going through all sorts of motions, when his whole being cries out for the opportunity to shuck his coat and feel the sweat spring from his pores, while he knows that he is working his own crop with his own muscle and that the returns for his labor will go into his own pocket.

USE OF LAND HINDERED BY OTHER TEACHING.

Failure to pay attention to the home conditions and home work of the agricultural pupils one may suspect is often to be found in the fact that the instructor must teach other subjects than agriculture. The questionnaire called for returns as to how many agricultural

instructors were called upon to teach other subjects than agriculture. Thirteen reported that they taught only agriculture, 41 reported that they taught other subjects. Among the other subjects which the instructors were called upon to teach were the following: Physical training, manual training, physiology, biology, zoology, botany, physics, chemistry, physical geography, bookkeeping, psychology, rhetoric, English, Latin, German, algebra, geometry, history, civics, and geography.

USE OF HOME FARM LAND MOST IMPORTANT.

Your committee feels that an enormous opportunity for usefulness, both cultural and vocational, is being missed where the teaching of agriculture by high schools is not so conducted as to stimulate home production and to bring that home production to a high state of efficiency through the patient and sympathetic but persistent supervision of competent agricultural instructors. It is reported that in New York 28 high schools are teaching agriculture; in Ohio, 900. Your committee is of the opinion that the hour is at hand for furthering, not so much the rapid extension of the teaching of agriculture to an ever-growing number of high schools, as the improvement of the quality of the instruction where it is already established by centering it upon supervised economic production carried out by the pupils on their home farms.

(c) IN ELEMENTARY SCHOOLS.

RETURNS FROM OHIO.

Ohio reports that 10,000 elementary schools in that State are now teaching agriculture. Mr. Lester S. Ivins has written that in Ohio there are now about 1,500 boys in the acre corn contest and 2,000 boys in the acre wheat contest. Winning boys in each county get large cash prizes and free trips to Washington, D. C. The above contests are by country boys in the country, excepting in a few cases where city boys went out into the country and secured acre plats in order to get into the contest.

Our estimate on village and city gardens, on vacant lots and back-yard home gardens, is 25,000 pupils. This is very conservative, because many gardeners in out of the way places did not register.

The following is a very interesting report of the Willard School Farm, Willard Avenue, Cleveland, Ohio, submitted by Mr. R. F. Powell:

Our Willard School Farm is just closing a very successful summer's work, a report of which I will gladly send if you desire it. It is not, however, a part of any high-school or grade-school curriculum. The class is conducted during the summer months

only, and the class is made up of volunteers, principally from Willard School fourth, fifth, sixth, seventh, and eighth grades.

To properly describe the land that we have in use, I need to divide it into three parts: First, Willard Farm proper consists of three large vacant lots in close proximity to each other, which together contain 2½ acres. They are divided into 135 gardens containing 600 to 800 square feet each. They are properly prepared and fertilized and are loaned to children in the fourth, fifth, sixth, seventh, and eighth grades of the public schools to cultivate, on condition that the plot must be well cultivated and cared for and that the holder must not trespass upon anyone else's garden, on pain of forfeiture of his or her plot. Everything grown upon a garden belongs to the boy or girl who does the cultivation and may be disposed of as he or she may wish.

Each gardener pays a fee of 35 cents if in the eighth grade and 25 cents in all other grades, for which he receives all the seeds and plants and tools required in his garden.

When a boy or girl passes out of the eighth grade, if he wishes to continue his agricultural work he must borrow a vacant lot of someone any size up to a half acre. These are also thoroughly prepared and fertilized. The gardener furnishes all his seeds, plants, and tools and receives the entire crop. There were 3½ acres of such lots cultivated by my boys this year. Four of these boys earned from \$75 to \$150 each during the summer months. The third division of the work is the home garden. It is usually in the back yard or a vacant lot next door. The care of preparing and fertilizing is done by the gardeners, which often includes two or more members of the family. My only part in connection with these gardens is an occasional visit and such kindly advice as may be asked for. There were about 500 such gardens this year in this (Willard) School District. Last year there were about 250, and the year before about 125. I think I am justified in believing that much of this rapid increase in the number of home gardens is due to the very successful gardens that the 165 children had in Willard School Farm.

RETURNS FROM MASSACHUSETTS.

In Massachusetts, under the inspiration and guidance of the extension department of the Massachusetts Agricultural College, land has been used the past year by school children, chiefly elementary, as follows: Raising corn, by 4,562 children; raising beans, 1,814; raising potatoes, 6,781.

Mr. W. R. Hart, professor of education at the college, who gave these figures, wrote further as follows:

In addition to these, there were two clubs, smaller in number—one, the potato culture club, numbering about 190. These were given special directions as to the culture of potatoes, with a view to discovering a strain of high-yielding tubers by selection of seed from the best producing hills. Another club which I organized this year for the first time is called the Junior Corn Growers' and Junior Potato Growers' Club, in which a half acre of potatoes and a whole acre of corn were taken as a basis of competition in a prize contest. This club numbered 29, located for the most part in Hampshire County. I did not extend it throughout the State, because I wanted to make a try-out of the details of the work connected with such a club before making it a State-wide organization. I have now got the matter sufficiently well in hand to extend the proposition to all boys of the State next year. It will constitute one feature of the work in charge of Prof. Morton. After this year's experience, it seems advisable to reduce the area in the case of potatoes to one-eighth of an acre and in the case of corn to one-fourth of an acre. Quite a number of Mr. Burke's boys in

Hadley were in this contest, and I find that not only his boys but those in Amherst, who are attending school, are having difficulty in securing the crops on as large an area as the acre of corn or the one-half acre of potatoes without hiring considerable help. It is on this account that I think it advisable to reduce the area, especially in the case of boys who are attending school. For young men under 19, who have quit their school work, a larger area may still be advisable and some change in that direction may be made in the future.

APPENDIX A.

SUMMARY OF INFORMATION FROM SPECIAL SCHOOLS OR CURRENT BULLETINS.

(Figures in parentheses are cost of maintaining land, annually, as reported.)

ALABAMA.

First District School: 57½ acres owned. (\$1,000.) Demonstration work; 5 varieties corn; 7 varieties wheat, in 1-acre plats.

Third District School: 40 acres owned; 25 acres in cultivation, experimental. Work: Chemical needs of soil are studied; physical defects are remedied; improvement of worn soil; rotations are practiced; variety tests of corn done; fertilizer tests of corn and cotton made; variety tests of grasses and forage crops; cultural methods taught; students are required to do some farm work.

Fifth District School: 80 acres owned; not all used for demonstration work. Breeding work: Plats, 15 acres wheat, corn, oats, and vegetables. General farm work, 45 acres.

Sixth District School: 80 acres owned. (\$1,000.) Variety and fertilizer tests. Demonstration for maximum yields, 1 acre. Three-fourths of land used for demonstration of corn and cotton. All boys required to do two hours of work per week on farm.

Eleventh District School: 300 acres owned; 60 acres under cultivation; 20 acres for experimental purposes; remainder for general farm crops.

ARKANSAS.

First District School: 462 acres, consisting of both high and low lands. Various crops; 300 acres used. Hired labor and some schoolboys carry on the work. During school year the boys did major portion of work. Much stock.

Second District School: 200 acres tillable land. Corn, 47 acres; sorghum, 30 acres; melons, 2 acres; etc. Orchard. 1912—Acre rotation plots, cooperative plan; school to furnish seed, tools, etc., and boys the labor. Each to share one-half. Much stock.

Third District School: 400 acres; 150 acres cultivated for demonstration purposes; remainder for general farm. Orchard work; breeding plat work; seed selection work; variety testing work, 68 acres; fertilizer test; deep plowing test; cover crops experiment; much stock.

Fourth District School: 500 acres; some gravelly ridges and some bottom land; 100 acres to general crops. All work done by students, paid. Have some live stock.

CALIFORNIA.

University Farm School, at Davis: 779 acres. Experimental work by the agricultural experiment station of the University of California. Field work by students, observation. In agricultural botany students have small (20 feet by 24 feet) garden plats. Demonstration and experiment plats are in charge of experiment station and separate from school.

COLORADO.

Fort Lewis School of Agriculture: 6,400 acres; 180 acres cultivated. Grains and orchard work.

GEORGIA.

General notes for all the district schools of Georgia: Students work on farm part time during school year; paid; third and fourth year students have acre plats. Class and field work go together. Income from farms, 1911, \$395 to \$3,716; from the 11, \$22,832.

Second District School: 315 acres; 80 acres in practical farming, agronomy; 5 acres, horticulture; remainder for pasturage and forestry. Have some stock.

Fifth District School: Monroe, Ga. No data.

Ninth District School: Model farm.

MARYLAND.

Sparks Agricultural School: 7 acres owned. Experiments in orchard. Dozen one-eighth acre wheat varieties; 20 grass plats. Each student has 1 acre at home for summer work. Demonstration plats on 25 farms; alfalfa, etc.; work on 100 farms in 1911; 200 corn growers' club plats in 1911; new variety corn introduced on 1,000 farms.

MASSACHUSETTS.

Smith's Agricultural School: 93 acres owned. Demonstration. (\$1,500.) Five acres growing young apple orchard; 1 acre spraying, pruning, and renovating old orchard; one-fourth acre raspberries; one-eighth acre peach nursery; 2 acres garden; one-fourth acre ear to row corn test (best yield 116½ bushels corn from 50 hills); one-fourth acre alfalfa; remainder general crops.

MICHIGAN.

Dunbar School, Chippewa County: 600 acres; 80 acres cultivated. (\$1,500.) Second year only. Have some stock. Students work part of time, by groups; no individual plat work yet. Planned: Agronomy, 1 acre to one-twentieth-acre plats; grain breeding and forage crops; preparing seed bed and fertilizer. Horticulture, 1 acre; vegetables for school only; propagation of plants and cultural methods. Soils and fertilizers, 1 acre to one-twentieth acre; to determine what special fertilizer is needed. Remainder, pasture for cows and pigs and grain for stock; some forestry work.

Menomnie County School: 105 acres; use 52 acres. (\$1,200.) (Receipts for 1911, \$564.) Agronomy, 40 acres, one-tenth acre to 4-acre plats. Horticulture, 1½-acre to one-tenth acre plats. Demonstration work outside with alfalfa and potatoes; experiments with green manuring and fertilizers; different rotations of crops; corn breeding work.

MISSISSIPPI.

Harrison County: 500 acres; 25 acres worked in 1912; 2 acres by each student; 5 acre demonstration plats; 1-acre to one-twentieth-acre fertilizer plats; have stock.

Bolivar County Industrial College: 20 acres of land. No data received.

Sunflower County, Moorhead: 35 acres; ¼-acre rotation plats planned for next year; students have plats—they draw plans, prepare soil, and do demonstration work; aim is to have an ideal farm.

Jones County Agricultural High School: 40 acres. (\$500.) Land is terraced; cleared of stumps. (\$1,000.) Soil-improvement crops put on last season; aim is to make farm work demonstrational; farm is now on self-supporting and paying basis.

Acorn County: 40 acres owned; land is worn out; will be built up.

Simpson County: 5-acre to one-half acre demonstration plats in soils and fertilizers; experiments carried on by subsoiling with dynamite.

44 AGRICULTURAL INSTRUCTION IN SECONDARY SCHOOLS.

Norubes County: 40 acres. (\$1,500.) Demonstration—1 acre wheat; 7 acres corn; one-fourth acre peanuts; 1 acre peas; one-fourth acre beans; one-eighth acre soy beans; 1½ acres potatoes; 1 acre garden; 15 acres hay. Aim is to distribute garden seed and to teach diversified farming.

Mayne County: 90 acres; 40 acres in open; have stock. All students do some farm work. Demonstration plats—13½ acres in one-half acre plats; 6 acres in agronomy department, inclusive; horticulture—fertilizer on corn; 1½ acres in one-eighth acre to one-fourth acre plats to show yields, adaptability, root and stem growth. Soils and fertilizers: 2 acres nitrate of soda on oats and corn; 2 acres to find difference in uplands and lowlands for cane; 1 acre to find difference in benefit to land of grass and pea crop; general uses for remainder of farm. "Offering suggestions to those who will take them" is one of the aims.

NEW YORK.

State School of Agriculture at Alfred: 236 acres owned; 130 acres cultivated. (\$150.) To determine comparative yields of cereals and root crops; commercial records kept on farm; to demonstrate advantage of seed selection and breeding of pure seeds; drainage; fertilizer tests; to demonstrate profit of old abandoned orchard; to show cost account of 1 acre renovated orchard (net income \$100); to show 1 acre potato yield 288 bushels; (\$44); 17 acres were used exclusively for experiments and growing plants for class use; much stock kept; variety work done.

State School at Morrisville: 200 acres for demonstration work; has some stock.

State School at Canton: 170 acres, leased; no experimental work planned; have stock. (1) Work to determine cost of production: 4½ acres potatoes—planting, spraying, stumping, selecting seed, fertilizing, and digging; corn, 18 acres; oats, 16 acres; cabbage, 1½ acres; beets, seven-sixteenths acre (one-half sugar beets); alfalfa, nine-sixteenths acre; hay, 43 acres. (2) Demonstration work: (A) Fertilizer for oat plant; proper amount of seed per acre without loss to clover seeding. (B) Ear-to-row corn work; corn breeding. (C) Chemical fertilizer.

OKLAHOMA.

Murray State School: 190 acres; 10 acres for demonstration purposes. (\$4,000.) Has stock. Students do no work yet, but will have it soon; they have 1½ hours' work a week now. Agronomy, one-fourth acre plats; cost of production; system of culture, care, etc. Soils and fertilizers, 10 acres; barnyard fertilizer; next year will have commercial fertilizer; balance of farm for farm crops. Experiment work on outside farms in wheat, corn, milo maize, Kafir corn, soy beans, peas, peanuts, alfalfa.

Connors State School: 160 acres owned. (\$1,000.) Demonstration work; good farming methods are advanced. Experimental work may be taken up next year. Students are required to do some work on farm.

Cornell State School: 91 acres; experiment farm crops. (\$2,000.)

Cameron State School: 160 acres; part upland and part lowland; 100 acres cultivated, showing cultural methods; 4 acres irrigation plant. Value of good seed; variety testing. Road making.

Panhandle Agricultural Institute: 80 acres. (\$600.) 10 acres in 1912. Summer tilled one-half and put one-half to crops. Work: Best cultural methods; grading and judging plants; study of seed. Experiments: Testing use of fertilizer; various grain and forage-crop experiments; breeding work; drought-resistance crops. Increased plats to farmers; 65 acres in 1912; 30 acres summer tilled; one-half acre alfalfa; 1½-acre fertilizer test; 5 acres for crops for class use; 2-acre drought-resistance crops; 1 acre sorghum; 2 acres orchard; 18 acres increased plats.

Haskell State School: 80 acres. Results: 1 variety broom corn, O. K.; several cross-bred sorghums, promise well. Plans: Pure seed work.

PENNSYLVANIA.

National Farm School: 360 acres; cultivated by student body of 74, who work three years, using one-tenth acre plats; they work 31 hours a week; \$9,000 net profit; \$500 were paid to two only, who cultivated 50 acres; corn breeding work carried on; work with shrubs and flowers. Production: 119 acres hay, 9 acres sweet corn, 10 acres tomatoes, 10 acres apples, 1 acre grapes, 13 acres rye, 9 acres oats, 4 acres vegetables, 61 acres corn, 8 acres potatoes, 4 acres pears, 8 acres cowpeas, 4 acres wheat, 1 acre cabbage, 2 acres asparagus.

VERMONT.

Randolph Center: 100 acres owned. (\$1,200.) School farm used as model and demonstration farm for school; animals and fields used as material for school; experiments are being carried on in corn breeding, oats, and fertilizers; cooperative work on orchards, cow testing, and agricultural advice.

WISCONSIN

La Crosse County School: 140 boys in county each have one-half acre plat—come under school direction; demonstration plats, 5 acres. Agronomy, one-tenth acre to 1 acre; alfalfa, oats variety tests, fertilizer tests, ear-to-row corn test. Soils and fertilizers. Use peat and commercial fertilizer on sandy soil. Forage crops—Canadian peas and oats for hay; corn for silage; alfalfa.

Dunn County School: 6 acres; leased since 1902. Horticulture—different trees and shrubs planted; work with various grains; vegetables; variety tests carried on; treatment; fungus diseases, insect control; land first planted to corn; now in alfalfa; want 80 to 160 acres of land.

Milwaukee County School of Agriculture: 236 acres; owned; 10 acres orchard; 200 trees and 7,000 plants of various types.

Winnebago County, Winneconne: 11 acres, (\$250.) Drainage work carried on; need 40 acres for model farm and 5 acres for testing varieties. Agronomy: 2 varieties wheat, 1 acre each; 1 variety corn, 5 acres; 2 acres for ear to row corn test; 1 acre for orchard and shrubs; onions, 1 square rod, several fertilizers used; variety test work with potatoes, soy beans, and cabbage. Corn-growing contest carried on on outside farms. Farm side a failure.

Marathon County, Wausau: 3 acres; raise pedigreed grains; orchard, 1 acre, used for experiment and demonstration work in pruning and spraying by students.

Marinette County, Marinette: 6 acres. (\$500.) 2 acres of one-eighth acre plats for agronomy demonstration work; 2 acres of one-half acre plats for fertilizer work.

APPENDIX B.

Demonstration work at Northwest School of Agriculture, Crookston, Minn.

(Income 1912, \$5,600.)

Projects	Acres	Year started
1. Five-year rotation	2.5	1911
2. Three-year rotation	1.5	1911
3. Wheat continuously	.5	1911
4. Wheat continuously with red clover	.5	1911

46 AGRICULTURAL INSTRUCTION IN SECONDARY SCHOOLS.

Projects.	Acres.	Year started.
5. Seven-year rotation.....	3.5	1911
6. Corn continuously.....	.5	1911
7. Milling-wheat experiments (4 varieties).....	.75	1912
8. North Dakota wilt-resistant flax (variety test).....	.25	1912
9. Alfalfa work (variety, fertilizer, and nurse-crop tests).....	2.0	1908
10. Quack grass plot.....	1.0	1910
11. Variety test of 137 varieties of wheat, oats, and barley.....	7.7	1912
12. Fiber flax (experiment in cooperation with Federal Government).....	2.0	1912
13. Corn breeding (Minnesota No. 23).....	1.0	1911
14. Winter-wheat experiments.....	1.0	1911
15. Tillage experiment:		
(a) Use of packer.....	.5	1912
(b) Subsoil plowing.....	.5	1912
(c) Dynamite subsoiling.....	4.0	1912
16. Rate of sowing grains:		
(a) Wheat.....	1.0	1912
(b) Oats.....	1.0	1912
17. Methods of sowing grass—		
(a) On disked barley stubble.....	1.15	1912
(b) On fall plowing.....	.38	1912
(c) On corn stubble.....		1912
(d) On potato ground, not plowed.....		1912
(e) Demonstration plots.....	.25	1911
18. The use of fertilizers (demonstration with crops in a 7-year rotation, and with alfalfa).....	.20	1912
19. Major farm rotation:		
(a) 5 fields of 50 acres each in 5-year rotation.....	250.0	1911
(b) 7 fields of 30 acres each in 7-year rotation.....	210.0	1911
20. Drainage (see Bulletin No. 110; Minnesota Experiment Station).....	320.0	1908

For projects in poultry raising see Bulletin No. 119, Minnesota Experiment Station.

Horticultural projects were as follows: (1) Variety testing in vegetable garden—(a) Cucumbers, 2 varieties; (b) cabbage, 2 varieties; (c) beets, 3 varieties; (d) carrots, 4 varieties; (e) parsnips, 3 varieties; (f) peas, 3 varieties; (g) radishes, 3 varieties; (h) sweet corn, 3 varieties; (i) tomatoes, 7 varieties; (j) beans, 2 varieties; (k) onions, 4 varieties; (l) lettuce, rutabagas, and turnips, 1 variety each; (m) cauliflower, 2 varieties; (n) squash, 2 varieties; (o) pie pumpkin, 2 varieties.

(2) Potatoes: (a) Variety testing, 7 varieties; (b) potato experiments—Selected seed (cellar selection), hill-selected seed, common-run seed, rose tips or run-out seed, scabby seed treated with formalin, scabby seed untreated, seed ends as seed, stem ends with eyes; (c) experiments on larger fields—Early Ohio treated with formalin, untreated seed, Carmen No. 1 treated, Carmen No. 1 untreated; (d) spraying experiment—Early Ohio sprayed three times, Bordeaux 5-5-50; early Ohio checked; Carmen No. 1, Bordeaux 5-5-50, three times; Carmen No. 1 checked; all other varieties sprayed two times, 5-5-50.

(3) Nursery work: (a) Fruit-tree grafting; (b) cuttings planted; (c) seed collecting.

(4) Fruit planting: (a) Apples, 6 varieties; (b) crab apples, 4 varieties; (c) plums, 3 varieties; (d) cherries, 2 varieties; (e) bush fruits, 4 varieties; (f) strawberries, 4 varieties.

(5) Conifers, 3 varieties.

(6) Experimental lawn seeding.

Another project of the Crookston school was that of minor rotation for hogs.

APPENDIX C.

List of 1912 suggestive topics for "summer practicum" work, Northwest School of Agriculture, Crookston, Minn.

1. Growing green feeds for hogs. Feeding. Results.
2. Planting of fruit trees and shrubbery.
3. Various garden projects.
4. Growing green feeds for chickens. Feeding. Results.
5. Various cultivation projects.
6. Various fertilizer projects.
7. Grain breeding work.
8. Corn breeding work.
9. Alfalfa growing.
10. Full system of farm accounts of home farm.
11. Laying out the home farm and starting a rotation.

APPENDIX D.
Massachusetts State-aided vocational agricultural education: Examples of the income of pupils from farm work during attendance at school in 1912.

School or department.	Pupil's age.	Project or projects.		Pupil's project income.			Other family income from pupil's project.				Cash or credit received by pupil from farm work during project period.			
		Title.	Scope.	Net profit.	Paid self for labor.	Total.	Labor, man or horse.	Rent, seed, etc.	Total.	At home.	Away from home.	His own project.	Grand total.	
Northampton	18	Dairying (Hotbed)	12 Jerseys, Nov.-June	\$270.24	\$109.02	\$379.26	\$109.02	\$662.47	\$771.49	\$200.00		\$379.26	\$579.26	
Northampton	19	Poultry	Mar. 1-June 7	37.90	46.60	84.50		4.95				122.94	317.99	
Northampton	18	Potatoes	22 R. I. reds, 1 acre	16.28	22.94	39.22	3.10	6.40	64.30	180.00	\$14.75			
Northampton	18	Hotbed	1,000 plants	26.65	34.70	61.35	16.80	1.70						
Northampton	18	Poultry	Early spring	1.44	4.50	5.94	4.83	8.44	37.16	175.00	98.00	181.81	264.81	
Northampton	18	Poultry	White leghorns	28.74	33.26	62.00	4.83	22.16	16.10		102.50	32.94	195.44	
Northampton	20	Alfalfa	52 barrel racks 4 months	19.22	32.94	52.16	4.83	31.35	41.32		145.65	4.83	149.85	
Northampton	16	Garden and potatoes	Seeding down 1 1/2 acres	91.30	16.76	108.06	21.45	1.06	30.45	100.61	44.00	110.06	258.66	
Northampton	14	Garden	1/2 acre each	44.35	12.00	56.35	5.00	15.35	20.35	164.60	6.08	56.35	227.03	
Petersham	14	Garden	1/2 acre	10.67	21.00	31.67	4.00	4.75	8.75	150.00	2.50	30.61	183.17	
Petersham	17	Garden	1/2 acre	14.03	11.80	25.83	4.65	16.60	21.25	63.50	36.50	21.00	111.25	
Petersham	15	Garden and potatoes	1/2 acre	18.00	15.00	33.00	23.31	26.75	49.80	137.50	27.00	78.45	260.85	
Hadley	17	Fruit and corn	1 acre c. 118 apple trees	64.00	8.45	72.45	47.14	16.00	24.00	116.00		97.00	213.00	
Hadley	18	Bees, poultry, corn	3 hives, 25 R. I. reds, 1 acre c.	38.50	38.50	77.00	5.00	16.00	24.00					
Hadley	18	Corn and poultry	1 acre c., 19 birds, 30 eggs	28.27	20.20	48.47	16.60	10.50	27.10	232.00	15.00	48.47	286.47	
Hadley	18	Fruit and poultry	20 apple trees, off year, 34 R. I. reds	20.15	6.15	26.30	3.00	2.00	5.00	47.30	125.30	26.30	188.90	
Hadley	17	Poultry	124 sq. rods	7.85	13.50	21.35		3.00	3.00	202.50	12.50	21.15	238.15	
Northborough	16	Garden	91 sq. rods	30.00	3.00	33.00	3.13	6.00	3.13	168.00	15.00	57.70	233.00	
Northborough	16	Potatoes and corn	1/2 acre p., 1/2 acre c.	21.50	13.80	35.30	5.85	12.65	18.50	18.50	197.50	37.90	234.80	
Northborough	17	Potatoes	1/2 acre c., 1/2 acre p.	33.10	11.25	44.35	9.26	46.95	56.20	132.00	5.00	44.35	191.35	
Northborough	16	Potatoes	1/2 acre (drought)	92	1.57	93.57	1.40	21.60	23.00	167.50		48.49	153.99	
Harwich	15	Garden	1 acre	31.27	15.20	46.47	6.00	2.50	8.50	10.00	10.00	93.10	108.10	
Harwich	17	Garden	1/2 acre	75.00	8.10	83.10	1.20	4.00	5.20	65.00	5.00	35.03	100.03	
Harwich	17	Garden	1/2 acre	15.95	22.70	38.65	1.30	4.00	2.70	75.00		22.62	102.62	
Harwich	14	Garden and potatoes	1/2 acre	7.90	7.00	14.90		1.30	9.62	12.00	38.00	14.90	64.90	
Totals for 25 pupils				446.72	1,513.47	319.04	319.04	994.60	1,313.64	2,840.10	752.18	1,510.02	5,102.30	

1 Project income less shrinkage in inventory of \$3.45 gives \$51.81.

APPENDIX E.

QUESTIONNAIRES SENT OUT.

I.

Use of land by high schools teaching agriculture, school year 1911-12.

Please send returns by November 1, 1912. Returns earnestly desired.

1. High school teaching agriculture. Name.....
Location.....
2. Agricultural instructor:
Name..... Address.....
3. Number of agricultural pupils.....
Number of girls taking agriculture.....
4. Agriculture is taught in what year or years of high-school course?.....
(1) Number of weeks in school year.....
(2) Agriculture, how many weeks per year?.....
(3) Agriculture, how many days per week?.....
(4) Agriculture, how many periods per day?.....
5. Are agricultural pupils fitted for college?.....
Or fitted primarily for farming?.....
6. How many agricultural pupils live at home during school year?.....
(1) Number of nonresident or boarding agricultural pupils.....
7. Is agricultural production on home farm land or on other land apart from the school premises required?.....
(1) Number working such land.....
(2) Area, in acre terms cultivated by each.....
(3) Does the pupil keep strict accounts?.....
(4) Who has the profit, parent or pupil?.....
(5) Highest net profit this year.....
A. Additional amount paid self for labor.....
(6) Commonest profit.....
(7) Does the agricultural instructor supervise this home farm productive work?.....
A. Supervises how often during term time?.....
B. How often in summer?.....
8. Has the high school productive farm land?..... How many acres?.....
(1) Are agricultural pupils required to cultivate it?.....
(2) Primarily for whose profit, that of school or pupil?.....
(3) Do pupils work as a group or gang?.....
(4) Do pupils work individual plats?.....
(5) If so, size of plats in acre terms.....
(6) Profit of school this year.....
(7) Profit per pupil.....
9. What area, if any, is devoted to demonstration plats?.....
Size of plats?..... Showing what?.....
10. Does agricultural instructor teach nonagricultural subjects?.....
(1) If so, what?.....
(2) A. How many periods per week for agriculture?.....
B. How many for nonagricultural subjects?.....
11. Proportion of time given to—
General study of agriculture.....
Agricultural science as directly applicable to the productive enterprises undertaken by the pupils at home or at the school.....

12. Remarks:
 (Continue remarks on back of sheet and on other paper at will. Speak of features which have given you the best practical and educational results.)

II.

Use of land by special secondary schools of agriculture, school year 1911-12.

1. Name of special school of agriculture.....
2. Location of this school.....
3. Name and title of head of school:
 Title..... Address.....
4. Number of years in agricultural course,; weeks in school year.....
 - (a) Agronomy (including agronomy, grain judging, field crops, etc.) is taught days a week weeks a year during years.
 - (b) Horticulture (including horticulture, vegetable gardening, fruit growing, plant propagating, etc.) is taught days a week weeks a year during years.
 - (c) Soils and fertilizers are taught days a week weeks a year during years.
 - (d) Animal husbandry (including animal breeding, dressing meats, feeding, poultry husbandry, stock judging, study of breeds, veterinary science, etc.) is taught days a week weeks a year during years.
 - (e) Farm engineering (including blacksmithing, carpentry, drawing, farm machinery, gasoline engines, farm drainage, etc.) is taught days a week weeks a year during years.
 - (f) Agricultural science (including agricultural botany, agricultural chemistry, agricultural physics, economic entomology, etc.) is taught days a week weeks a year during years.
 - (g) Dairying (including dairy husbandry, dairy chemistry, dairy practice, dairy breeds, etc.) is taught days a week weeks a year during years.
 - (h) Farm management (including farm accounts, farm management, agricultural economics) is taught days a week weeks a year during years.
5. Previous training of students.....
 - (a) Agricultural course fits primarily for what kind of work?
6. How many agricultural pupils live at home during school year?.....
 - (a) Number of nonresidents, or boarding, agricultural pupils.....
7. Is agricultural production on home farm land, or is other land apart from the school premises required?.....
 - (a) Number working such land.....
 - (b) Area in acre-terms cultivated by each.....
 - (c) Does the pupil keep strict accounts?
 - (d) Who has the profit, parent or pupil?
 - (e) Highest net profit this year.....
 - (a) Add what amount paid self for labor.....
 - (f) Commonest profit.....
 - (g) Do the agricultural instructors of the school supervise the home farm production work?
 - (a) Supervises how often during term-time?
 - (b) How often in summer?
8. Has the special school productive farm land?
- How many acres?
- (a) Age agricultural school pupils required to cultivate it

- (b) Primarily for whose direct profit, that of the school or pupil?
 - (c) Do pupils work as a group?
 - (d) Do pupils work individual plats?
 - (e) If so, size of plat in acre-terms
 - (f) Profit of school this year
 - (g) Profit per pupil
9. What area, if any, is devoted to demonstration plats on the school farm—total area
- (a) In agronomy acres. Size of plats
 - Showing what?
 - (b) In horticulture acres. Size of plats
 - Showing what?
 - (c) In soils and fertilizers work acres. Size of plats
 - Showing what?
 - (d) acres. Size of plats
 - (Add other work.)
 - Showing what?
 - (e) acres. Size of plats
 - (Additional work.)
 - (f) What uses are made of remainder of farm not devoted to demonstration or experimental plat work?
10. What demonstration work is being done by agricultural school on other farms privately owned?
- (a) In planning farm (starting rotations, etc.): Number of farms
 - (b) In conducting demonstration plats on farms: Number
 - (a) Showing what?
 - (c) In supervising live-stock breeding on farms: Number
 - (d) In actual management of farms: Number
 - (e) In keeping accounts of entire farms: Number
 - (f) In advising in management of farms: Number
 - (g) In sending out circulars regarding farms: Number
 - (h) Any other work
 - (i) Any other work
 - (j) Any other work
11. What distinctly experimental work is being done on the agricultural school farm?
- (a) In agronomy, state projects
 - (b) In horticulture, state projects
 - (c) In soils and fertilizers
 - (d) In any other work
 - (e)
 - (Any other.)
12. Total annual appropriation for farm work
- (a) Total annual appropriation for school work
 - Or, total annual appropriation for farm and school work
13. Is the school a separate institution? Unit of area
- (a) Is it a part of the State agricultural college?
14. Does the agricultural school own stock? If so, number of head of each kind
15. Remarks
16. Blank filled out by