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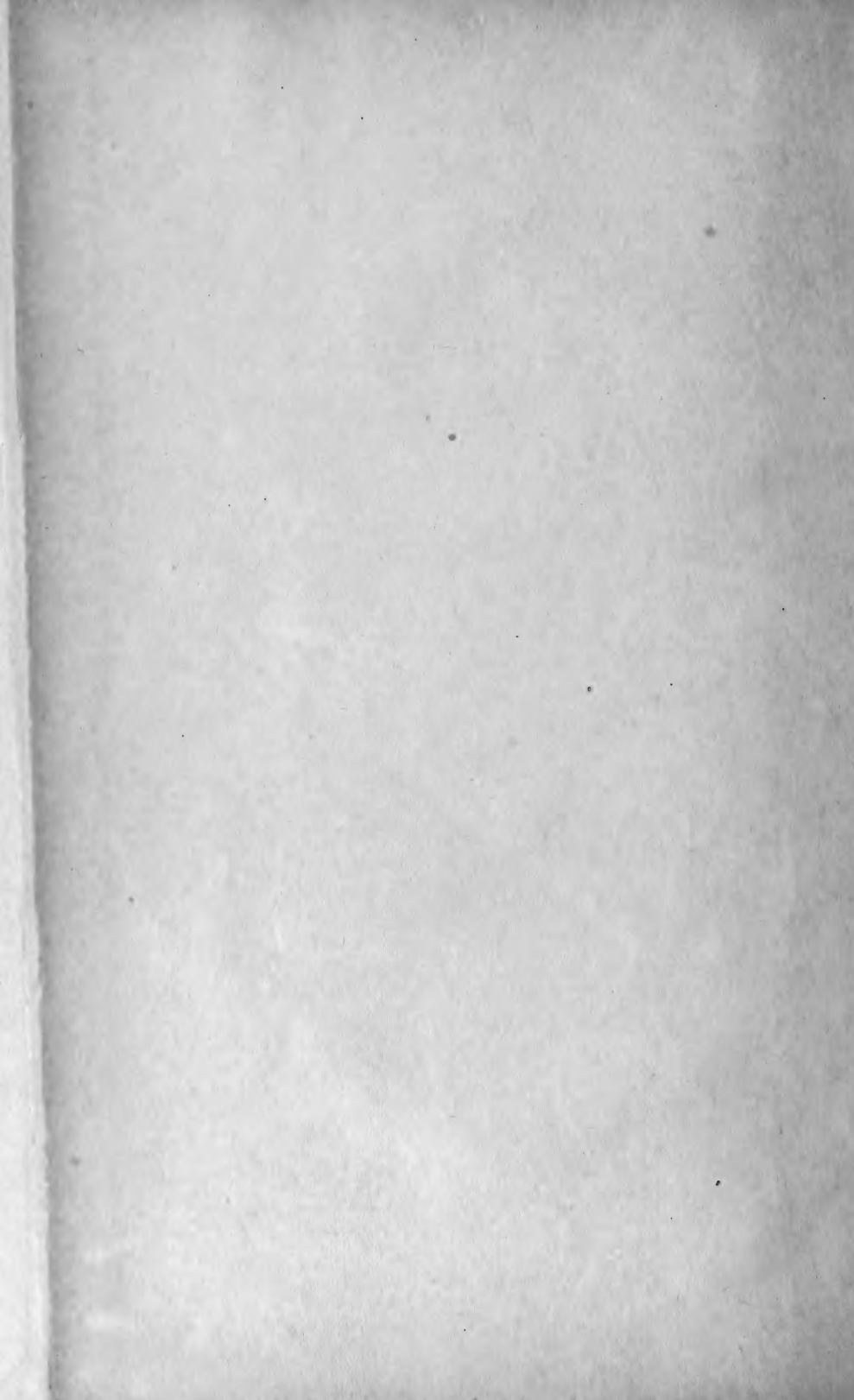
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1917









DEPARTMENT OF PUBLIC INSTRUCTION

Madison, Wisconsin

# Agriculture in the High School

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A MANUAL

FOR THE

HIGH SCHOOLS OF WISCONSIN

Prepared by

HENRY N. GODDARD

High School Inspector of Agriculture  
State Department of Education

Assisted by

JOHN A. JAMES

Assistant Professor of Agricultural Education  
University of Wisconsin

Issued by

C. P. CARY, State Superintendent

MADISON

DEMOCRAT PRINTING COMPANY, STATE PRINTER

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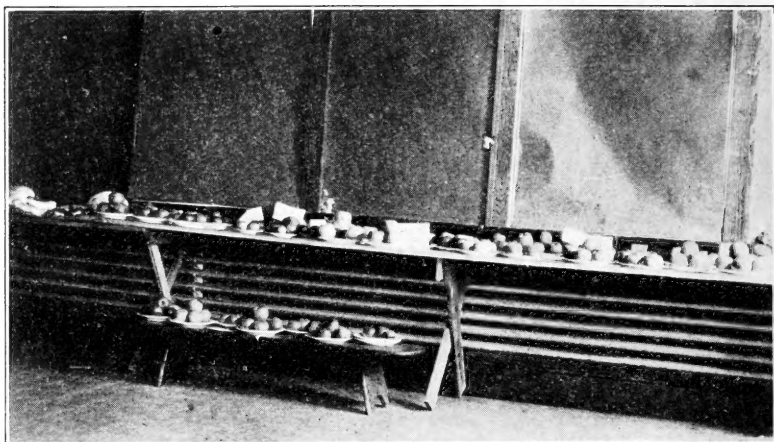
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*Wisconsin, Dept. of Education.*

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FRUIT EXHIBIT AT GRAFTON HIGH SCHOOL

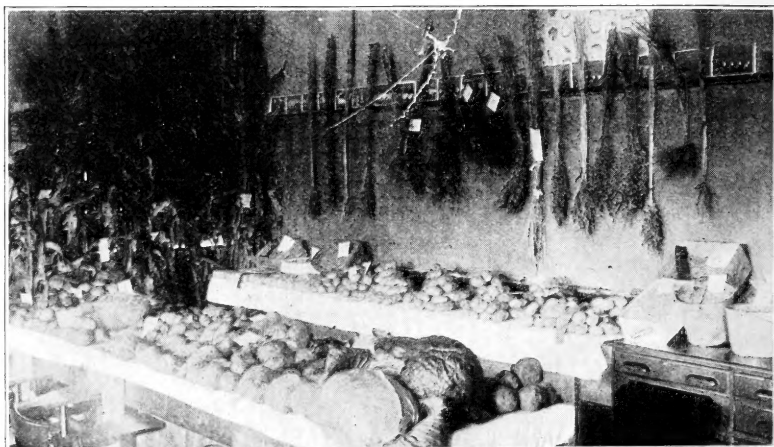


EXHIBIT AT BLOOMER HIGH SCHOOL

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# AGRICULTURE IN HIGH SCHOOLS

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## I. GENERAL STATEMENT.

1. **Brief historical sketch.** In 1901 the Wisconsin legislature passed two laws which gave definite form to the agricultural movement in this state. The first law required an examination in the elements of agriculture of all candidates for certificates to teach in the elementary schools. The second made provision for the establishment of county agricultural schools for the vocational training of boys and girls in agriculture and domestic economy. Four years later, in 1905 agriculture was made by legal enactment, a subject to be taught in all the district schools of the state. These laws together with reports and discussions connected with their passage, resulted in a very general movement toward agricultural education in Wisconsin. Eight county agricultural schools have been established and seven are now in operation, receiving liberal aid from the state. These schools at first organized two-year courses based upon completion of the eighth grade. Later, at least three of the schools in addition to the two-year courses, adopted full four year high school courses which are accepted for admission to higher institutions. These schools have thus become distinctly agricultural high schools. At the same time, agriculture was rapidly introduced as a subject of study not only into the country schools, but also to a large extent into graded and secondary schools. As the idea of vocational training grew in educational circles, it early became a conviction of many of the advocates of this kind of training that the public high schools, being peculiarly the schools of the people, could furnish one of the best agents for the development of a well-balanced type of vocational work. Furthermore, the newer viewpoint in education began to demand that high school courses should become vitalized by programs more closely related to social and industrial needs.

Accordingly, in response to a general demand throughout the state, the legislature of 1911 passed a law giving special state aid to high schools maintaining courses in manual training, domestic science and agriculture. Commercial courses were two years later included under practically the same provisions. Under this plan agricultural departments were rapidly organized in the Wisconsin

high schools. By 1913 there were sixty and in 1916 over eighty such departments in operation. In addition, the majority of high schools not having such departments are offering from one to three semesters of this work in connection with the regular science subjects.

A final step in the legal status of agriculture in the schools of the state was taken in 1913 when provision was made for special state aid to be given for short courses of agriculture or domestic science, maintained for not less than sixteen weeks and devoting at least eighty minutes a day to instruction in the special subject. At the same legislature provision was made for a short winter term course, for pupils unable to enter regular high school courses. A further development has consisted in the establishment in the state agricultural college and in two of the normal schools of the state, of special courses for the training of teachers of agriculture. Graduates of these courses go out largely into the high schools. At the same time all of the schools for the training of elementary school teachers, including the normal schools, the county training schools and the training departments in high schools, give instruction and professional training in agriculture.

**2. Text of laws.** The full text of the laws mentioned above is here given:

**Manual training; agriculture; domestic economy and teachers' training; state aid.** SECTION 496b. 1. Any board having charge of a free high school or of a high school having a course of study equivalent to the course prescribed by the state superintendent for such free high schools may establish and maintain in connection with the high school under its management, in counties where county training schools, or joint county training schools have not been established, a teachers' training course, which shall be especially approved by the state superintendent as to subjects required to be taught, and the qualifications of teachers, or in connection with said high school and the two upper grades next below the high school, as said board shall decide, a department of manual training, or domestic economy, or agriculture, or any or all of said departments.

2. The expense of maintaining such departments shall be provided for in the same manner as other expenses of maintaining such schools, and such departments shall be under the management, direction and control of such board.

3. The state superintendent shall, so far as his other duties may warrant, give such information and assistance as may seem necessary in organizing and maintaining such departments, and in arranging schemes and outlines of work; and with the aid of the inspectors of high schools, and when occasion shall require it, with the aid of the inspectors of graded schools, shall have the general supervision of all departments established under this section; and shall from time to time inspect the same, make such recommenda-



tions relating to their management as he may deem necessary, and make such report thereon as shall give full information concerning their number, character and efficiency.

4. The state superintendent shall establish a standard of qualification for all teachers in such departments, and may grant special certificates to such applicants as are fully qualified to instruct in special lines of work, which certificates shall be in such form and for such time as he may prescribe, and shall be regarded as qualifying the holders thereof to teach in those departments established under sections 496*b* and 496*c* which shall be named in such certificates.

(SECTION 496*c*) 1. Any school whose course of study or outline of work in teachers' training, manual training, domestic economy, or agriculture, has been approved by the state superintendent and whose teacher has been qualified may, upon application, be placed upon the approved list of schools maintaining such a department or departments.

2. A school once entered upon such list may remain there and be entitled to state aid so long as the scope and character of its work are maintained in such manner as to meet the approval of such superintendent. On the first day of July in each year the clerk of each school board maintaining such department or departments in the school or schools under its jurisdiction, or the city superintendent of any city where such an approved school is maintained, shall report to the state superintendent in such form as may be required, setting forth the facts relating to the cost of maintaining the department or departments established under sections 496*b* and 496*c*, the character of the work done, the number and names of teachers employed, and the length of time each department was maintained during the preceding year. And upon the receipt of such report, if it shall appear that the department has been maintained in a satisfactory manner for a period of not less than six months during the year, the said superintendent shall make a certificate to that effect and file it with the secretary of state.

**Special aid for manual training, domestic economy, or agriculture.**  
SECTION 496*c*. 3. Upon receiving such certificate the secretary of state shall draw his warrant for one-half the amount actually expended for instruction in each department established under sections 496*b* and 496*c* during the year for which the state aid is received, not, however, to exceed three hundred and fifty dollars for each department established under sections 496*b* and 496*c* and 496*c*—3 which shall have been maintained in connection with the high school and the two upper grades next below the high school, but not to exceed two hundred and fifty dollars for each department established under sections 496*b* and 496*c* which shall have been connected with only the high school. Provided, however, that no one school district shall receive aid in any one year for more than three such departments. The sum payable in accordance herewith to be

payable to the treasurer of the district or corporation maintaining the school for the school year ending June 30, 1913, and thereafter; provided, that the total amount expended for such purpose shall not exceed one hundred thousand dollars in any year which is hereby appropriated from any moneys in the general fund not otherwise appropriated. (1913 c. 656)

SECTION 496c—1. By and with the advice and consent of the state superintendent of public instruction, the district board or boards of education of two or more school districts each of which maintains a free high school, may unite in engaging the services of a suitable teacher or teachers of manual training for the purpose of giving instruction in manual training in the schools of the districts so uniting. Each of the school districts so uniting shall pay such share of the salary of the instructor or instructors of manual training as shall be proportionate to the time devoted to instruction in manual training in the schools of each said districts. Each school district included in such agreement and giving instruction in manual training in accordance with the provisions of this chapter shall receive the state aid provided for in this chapter. (1911 c. 491)

SECTION 5531—1. No state aid shall be granted to any school for instruction given in agriculture, domestic economy, manual training or industrial branches unless the salary paid to every teacher instructing in such subjects be at least at the rate of sixty dollars per month. (1911 c. 544)

**Agriculture and domestic science in high schools; short course.**  
SECTION 496c—4. 1. Any number not exceeding twenty high schools offering agriculture or domestic science courses, under the provisions of section 496d of the statutes, may each, under such conditions and regulations as the state superintendent of schools may prescribe, establish and maintain a sixteen weeks' course in agriculture, including rural economics, or domestic science, including home economics, or both, in connection with such high school commencing about November 1st of each year for pupils over fourteen years of age; provided, that this special course shall not be approved for any school unless the teaching force shall be adequate to properly administer all courses adopted and in force in such school. The additional teaching force needed and all other expense of maintaining such courses shall be provided for in the same manner as other expenses of maintaining such high school. The salary of said additional teacher or teachers shall not be counted in apportioning the general special aid or any special aid for agriculture or domestic science for a school administering such sixteen weeks' course in agriculture or domestic science. The tuition for all pupils attending such sixteen weeks' course shall be paid by the town at the same rate and in the same manner as is provided by section 496k of the statutes, except that no diploma or certificate of the county superintendent of completion of the course of study in the district shall be required.

2. Any such high school so establishing and maintaining such course upon complying with all the provisions of section 496c of the statutes may, upon application, be placed upon an approved list of schools maintaining such short course in agriculture or domestic science. The clerk of such school board shall make report to the state superintendent at the same time and in the same manner and form as required by section 496c of the statutes. Upon receipt of such report, if it appears that such course has been maintained in a manner satisfactory to the state superintendent; at least eighty minutes daily for said sixteen weeks, under the direct instruction of a teacher holding a special license from the state superintendent to teach such special subject, the state superintendent shall make a certificate to that effect and file it with the secretary of state. Upon receiving such certificate the secretary of state shall draw his warrant for the sum of two hundred dollars for each of the special courses maintained, the sum payable in accordance herewith to be payable to the treasurer of the district maintaining the school; provided that the total amount expended by the state for that purpose shall not exceed eight thousand dollars in any one year.

SECTION 2. There is hereby appropriated out of the general funds of the state the sum of eight thousand dollars annually for the purpose of carrying out the provisions of sections 496c—4. (1913 c. 635)

**Winter terms for high schools.** SECTION 494a. 1. The high school boards of not exceeding fifteen high schools may each, under such conditions and regulations as the state superintendent of schools may prescribe, establish a winter term commencing between the 30th of October and the 15th day of November, and continuing each year for a number of weeks equal to one-half the number of weeks school is maintained for the regular high school course during that school year.

2. The qualifications for admission to the course of study of said winter term shall be those prescribed for admission to the regular high school courses; provided, that persons not possessing the qualifications required for admission to the regular courses may be admitted to said winter term course upon the presentation to the high school principal of evidence through examination or otherwise satisfactory to him of ability to carry on the work of said course, and persons between the ages of sixteen and twenty years so admitted shall be entitled to the privileges prescribed in sections 496j to 496o, inclusive, of the statutes, and they shall also be entitled to enter the regular high school classes upon evidence satisfactory to the high school board and principal of their ability to do the work of such classes.

3. The course of study for such winter term shall receive the approval of the state superintendent; the additional teacher or teachers necessary to administer the said winter term course of study in addition to the regular courses of the school, shall be selected with his advice and consent, and the course of study shall be administer-

ed in a manner to meet his approval. Said teacher or teachers shall have the qualifications prescribed for teachers in free high schools. The salary of said teacher or teachers shall not be counted in apportioning the general special aid or any special aid for agriculture, manual training or domestic science for a school administering said winter term course under the provisions of this act.

4. On the first day of July of each year the clerk of each such high school board shall report to the state superintendent, in such form as may be required, setting forth the facts relating to the cost of maintaining the department established under this act; the character of the work done; the number and names of teachers employed, and the length of time it was maintained during the preceding year; and upon the receipt of such report, if it shall appear that the department has been maintained in a satisfactory manner, according to the provisions of this section, the said superintendent shall make a certificate to that effect and file it with the secretary of state. Upon receiving such certificate the secretary of state shall draw his warrant upon the treasury for two-thirds the amount actually expended for the salary or salaries of said additional teacher or teachers during the year for which the state aid is received, not, however, to exceed \$500 for any one school, said aid to be payable from the appropriation for winter term in high schools to the treasurer of the high school district maintaining the school.

#### COUNTY SCHOOLS OF AGRICULTURE AND DOMESTIC SCIENCE.

**County schools of agriculture and domestic science; organization; maintenance.** SECTION 553c. 1. The county board of any county is hereby authorized to appropriate money for the organization, equipment and maintenance of a county school of agriculture and domestic economy. The county boards of two or more counties may unite in establishing such a school and may appropriate money for its organization, equipment, and maintenance.

**Notice.** 2. Immediately after the county board or county boards shall vote to establish a county school of agriculture and domestic economy, the county clerk or clerks of such county or counties, shall notify the dean of the college of agriculture of such vote for the establishment of such school.

**Location.** 3. The dean of the college of agriculture, the state superintendent of public instruction, and the president of the board of agriculture, acting as a committee for such purpose, shall decide upon and notify the county board or boards as to the proper location for such county school of agriculture and domestic economy and the county school of agriculture and domestic economy shall be located at such place as is determined upon by such committee.

**Loans; bonds.** 4. The county board or boards of any county or counties so establishing such school is hereby authorized and empowered to borrow money, issue and sell bonds for the purpose of procuring and paying for the necessary grounds and erecting the necessary buildings, and for improving the same from time to time, for such county schools of agriculture and domestic economy.

**Board for, how appointed; vacancies on; oath of members; organization.** SECTION 553*d*. A board to be known as the county school board is hereby created, which shall have charge and control of all matters pertaining to the organization, equipment, and maintenance of such school, except as otherwise provided by law. Said board shall consist of three members, one of whom shall be the county superintendent of schools of the of the county or district, in which the school is located. The other members of the board shall be elected by the county board, for the term of three years from the date of their election, "but no member of the county board shall be eligible." Vacancies existing in the board from whatever cause, except in the case of the county superintendent, shall be filled by appointment made by the chairman of the county board, if the county board is not in session when such vacancy occurs. If the county board is in session, vacancies shall be filled by election by said board for the unexpired term. Appointments made by the chairman of the county board, as hereinbefore specified, shall be for the term to elapse until the next regular meeting of the county board. Each person appointed or created a member of the county school board, shall within ten days after the notice of such appointment, take and subscribe an oath, to support the constitution of the United States and the constitution of Wisconsin, and honestly, faithfully, and impartially to discharge his duties as a member of said board, to the best of his ability, which oath shall be filed in the office of the county clerk. He shall also, within the same time, file a bond in such sum as may be fixed by the county board, which bond shall be filed in the office of the county clerk. Within fifteen days after the appointment of said board, the members thereof shall meet and organize by electing one of their number as president. The county superintendent of schools shall be ex officio secretary of the said board. The said board shall prescribe the duties of the several officers, except as fixed by law.

**When two or more counties unite,** SECTION 553*e*. Whenever two or more counties unite in establishing such a school, the provisions of section 553*b* shall apply to the organization of the county school board, and to filling vacancies therein, provided that the county superintendent of the county in which the school is located shall be a member of the board and ex officio its secretary, and two members shall also be elected from each county by the county board thereof. "But no member of the county board shall be eligible."

**Apportionment of amounts for maintenance.** SECTION 553f. Whenever two or more counties unite in establishing and maintaining such school, the county school board provided for in such cases shall determine the amount of money necessary for the equipment and maintenance of the school for the second year, and annually each year thereafter; they shall apportion the amount to be raised by taxation among the counties in proportion to the assessed valuation of each county, as last fixed by the state board of assessment, and shall report to the county clerk of each county the apportionment so made on or before the first Monday of November in each year. The amount so apportioned to each county shall be levied in the county tax for the ensuing year for the support of the school.

**County treasurer ex officio treasurer of board.** SECTION 553g. The county treasurer shall be ex officio treasurer of said board; all moneys appropriated and expended under the provisions of sections 553c to 553l, inclusive, shall be expended by the county school board, and shall be paid by the county treasurer or treasurers on orders issued by said board, and all moneys received by said board shall be paid to the county treasurer for the fund of the county school board.

**Courses of study.** SECTION 553h. In all county schools of agriculture and domestic economy organized under the provisions of sections 553c to 553l, inclusive, instruction shall be given in the elements of agriculture, including instruction concerning the soil, the plant life, and the animal life of the farm; a system of farm accounts shall also be taught; instruction shall also be given in manual training and domestic economy, and such other subjects as may be prescribed.

**Land to be had in connection.** SECTION 553i. Each such school shall have connected with it a tract of land suitable for purposes of experiment and demonstration, and not less than three acres in area.

**Schools to be free; special instruction.** SECTION 553j. 1. The schools organized under the provisions of sections 553c to 553l, inclusive, shall be free to inhabitants of the county or counties contributing to their support, who shall be qualified to pursue the course of study; provided, they shall have at least the qualifications required for completion of the course of study for common schools. Whenever students of advanced age desire admission to the school during the winter months in sufficient number to warrant the organization of special classes for their instruction, such classes shall be organized and continued for such time as their attendance may make necessary.

2. Whenever any person not residing in a county maintaining a school of agriculture as provided in sections 553c to 553l, inclusive, shall become a student in any such school, the board thereof is hereby empowered to charge a tuition fee for such per-

son to be fixed by a majority of the members of said board at a regular meeting thereof, provided that such tuition fee shall not exceed one dollar per week for each nonresident pupil.

3. The county board of the county of which such person is a bona fide resident, is hereby authorized to, and shall provide, by tax upon the property of the county, a sum sufficient to provide for the payment of the tuition on account of the residents of said county who have attended such county school of agriculture and domestic economy, and the amounts so levied shall be collected when and as other taxes are collected, and shall be paid by the county treasurer of said county to the county treasurer of the county in which the county school of agriculture and domestic economy enrolling such person is situated; and the amount so received by such treasurer shall be placed to the credit of the county school of agriculture.

**Duty of state superintendent.** SECTION 553k. The state superintendent shall give such information and assistance and establish such requirements as may seem necessary for the proper organization and maintenance of such schools. With the advice of the dean of the college of agriculture of the state university, he shall prescribe the courses of study to be pursued, and determine the qualifications required of teachers employed in such schools. He shall have the general supervision of all schools established under sections 553c to 553l, inclusive; shall from time to time inspect the same, make such recommendations relating to their management as he may deem necessary, and make such report thereon as shall give full information concerning their number, character and efficiency.

**Approved list.** SECTION 553l. Any school established under the provisions of this act, whose course of study and qualifications of whose teachers have been approved by the state superintendent and the dean of the college of agriculture may, upon application, be placed upon an approved list of county schools of agriculture and domestic economy. A school once entered upon such list may remain listed and be entitled to state aid so long as the scope and character of its work are maintained in such manner as to meet the approval of the state superintendent; provided, that he shall not place upon said list more than seven schools.

**Report.** 2. On the first day of July in each year, the secretary of each county school board maintaining a school on the approved list, shall report to the state superintendent, setting forth the facts relating to the cost of maintaining the school, the character of the work done, the number and names of teachers employed and such other matters as may be required by the county board or the state superintendent. Upon the receipt of such report, if it shall appear that the school has been maintained in a satisfactory manner for a period of not less than eight months, during the year closing

on the thirtieth day of the preceding June, the said superintendent shall make a certificate to that effect and file it with the secretary of state.

**State aid.** 3. Upon receiving such certificate, the secretary of state shall draw his warrant, payable to the treasurer of the county maintaining such school, for a sum equal to the amount expended for wages of legally qualified teachers employed for at least eight months during the school year; provided that the total amounts so apportioned shall not exceed six thousand dollars to any one school in any one year when the average daily attendance shall be less than one hundred and twelve pupils, and shall not exceed the sum of seven thousand dollars when the average daily attendance shall exceed one hundred and twelve pupils and be less than one hundred and thirty-seven pupils, and shall not exceed the sum of eight thousand dollars when the average daily attendance shall exceed one hundred and thirty-seven pupils; when more than one county has contributed to the support of the school, the secretary of state shall draw his warrant payable to the treasurer of each county for such portion of the state aid as the amount contributed by his county is part of the total amount contributed by all the counties for the support of the school for the preceding year. The aforesaid amounts shall be charged to the appropriation for state aid for county schools of agriculture and domestic economy.

**Teachers' minimum salary.** SECTION 5531—1. No state aid shall be granted to any school for instruction given in agriculture, domestic economy, manual training or industrial branches, unless the salary paid to every teacher instructing in such subjects be at least at the rate of sixty dollars per month; provided, that no school district, offering instruction in such special branches shall be deprived of its right to share in the apportionment of state aid, that employs persons at a less salary per month to assist the legally qualified teachers in conducting such special work.

**3. Purpose of bulletin.** It is the purpose of this bulletin to furnish a guide to those high schools which give agricultural work and especially to those that maintain four-year agricultural departments. This guide aims to furnish information concerning the interpretation and application of the above laws; to indicate the requirements for the organization and management of such departments, and to offer suitable suggestions as to the scope and character of the work which is expected in order that state aid may be granted,



## II—POINT OF VIEW.

1. **A vocational or industrial course.** The underlying thought of agriculture in the high school is that of a vocational course correlated with a strong general high school course. The word vocational is used here in its broad general sense rather than in its strict technical sense. The course should be vocational in the sense that it should not only furnish a good understanding and appreciation of the problems of the farm, but that it shall also provide an opportunity for the pupil to find out what advantages this occupation has to offer and his own adaptability to such work. This means that the work must not only deal with practical materials of the farm in a scientific way, but it must also provide a means for the pupil to apply the best knowledge to actual farm practice and to be able to gain some skill in the most successful management. It is only through the application of the best knowledge in the rounding up of some worthwhile result and the realization of the rewards of this result through financial profit, a successful exhibit or in some other practical way, that any pupil has a fair chance to judge of his fitness or taste for this line of work. Furthermore, it is questionable whether the most valuable training can be gained except by such practical treatment. This need not mean that all pupils who take agriculture must necessarily become farmers, but they should be able to make better farmers if they decide to follow this occupation, and whether they follow it or not, they should receive a valuable vocational outlook which will be of great service in finally determining a desirable vocation. Finally, the work should provide a most valuable body of knowledge and a practical training which may be thoroughly worth while to any student whether he becomes a farmer or not. It is desirable, and it has already been demonstrated, that many of the pupils in the agricultural course will be led to select this as their vocation. Many country boys have been kept on the farm and a good many city boys have been directed to the farm through their agricultural work in school. However, careful observation leads to the conclusion that this is true only where the project side of the work has been given prominence.

From what has been said it will be understood that the agriculture course is not regarded as a modified form of science work managed on the plan of laboratory and instruction work, or even this plan supplemented by suitable field study. Such a course lacks motive and vital interest, however practical it may be made. It is necessary that these lines of work shall grow out of and be supplementary to a suitable line of projects involving actual farm practice with productive results.

**2. Relation to the general course.** The general course should provide a broad training and culture adapted to the needs of any good citizen. Such a course should include work along all the fundamental lines, such as language, history, literature, mathematics, science and the arts, but it is especially important that the general course should include strong work in the fundamental sciences. This work should give an intelligent basis for an understanding of the scientific principles which apply to the problems of agriculture. It is believed that with the grade of pupils found in the high school, the study of the fundamental sciences such as general science, biology, physics and chemistry, has a distinct value which cannot be realized to a satisfactory degree by approaching them wholly from the side of the applied subject, in other words, it is not satisfactory to teach fundamental principles only as they are needed from time to time in the agricultural subjects. These principles should be developed by the use of the most practical materials of which those of the farm are especially valuable, and by the largest possible application to the common processes of every day life, but some where these principles should be brought into relationship to each other and organized about the central, unifying idea of each subject. It is peculiarly the function of the science subjects of the high school to provide such a body of organized knowledge and to furnish a training which gives skill in making application to a wide variety of practical situations. Such a body of knowledge is not only more easily developed by special treatment of the fundamental sciences, and of larger value for general training, but it is at the same time more valuable for the agriculture because understood in larger relations.

These statements should not be understood as objections to general science as the approach, in the high school or in the later grades, to the special science subjects of the high school. It does mean, however, that subjects labeled agricultural botany, agricultural chemistry, etc., will not be regarded as agricultural subjects for which special aid is given. It should be added further, that such courses have not usually proved satisfactory as science subjects in the general high school course. Furthermore, the distinctly agriculture subjects will not be regarded as any part of the two units of science, which are required in the general course of all high schools. While the general course provides work adapted to general life needs and gives a sound basis for an intelligent understanding of the problems of agriculture, in turn, the vocational work vitalizes and gives meaning and motive to the other work of the school, thus helping to overcome the isolation of school work from every day life.

It has been the policy of Wisconsin since the special agricultural courses were provided for, to require four units or one-fourth of the full requirement, of distinctly agricultural subjects as a con-

dition of state aid. At the same time it is expected that the general course shall be adapted as far as possible to the needs of the special course. For example, the bookkeeping work of the general course should be related as closely as possible to the needs of farm accounts. As far as possible, opportunity should be provided for agriculture pupils to do some manual training in the line of farm carpentry, forge work, etc. Arithmetic should deal to a large extent with the practical problems of the farm. The science subjects should be correlated as closely as possible with the special work, for instance, the most effective arrangement for beginning botany has been found to be where it precedes or runs parallel to the first semester of farm crops. Furthermore, it is expected that principals in schools having the agriculture course will see to it that the regular daily program is made flexible enough for agriculture pupils, so that they shall have time to give proper attention to their project work. This may require an occasional excusing of these pupils from regular classes for a single period or even for several days if necessary when projects are being started, in order that these projects may have attention at the right time. While some manual training work especially adapted to the farm should be provided wherever possible, aid will not be given for both manual training and agriculture where both courses are given to the same pupils. The two courses should not be undertaken for aid except in schools large enough to provide separate groups of pupils for both. Special plans for manual training work in connection with the agriculture course are given later in this manual.

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### III—REQUIREMENTS.

**1. Administrative requirements.** In view of these considerations, the following requirements should be carefully considered by those expecting special aid for the agriculture course:

a. Four units of purely agricultural work must be offered with the exception that one-half unit of elementary science will be accepted as part of the required four units.

b. In addition to these four units, there must be given in the general course at least one-half unit of botany and one unit of physics, one unit of chemistry, or one unit of physics and chemistry. It is desirable that at least half a year each should be offered also in as many of the following as possible: chemistry, zoology, physiology and geography. (See suggestions under courses.)

c. The same general course requirements apply to the agriculture course as to all other courses. (See High School Manual p. 12.)

d. All schools giving the four-year agriculture course must offer some other course for the girls at least during the last two years. One year of agriculture work is usually all girls ought to be expected to take. Domestic science is urged as a course to accompany the agriculture wherever possible. In case only these two courses are offered the domestic science may be given during the junior and senior years. In case domestic science is not given an English course must be offered.

e. Aid cannot be granted for both agriculture and manual training unless the school is large enough so that separate pupils elect these courses. It is, however, urged that the manual training and mechanical drawing work outlined in this manual be given in connection with the agriculture course.

f. A well organized plan of project work for all of the pupils during each year of the course must constitute an essential part of the work. The home project is regarded as most essential wherever this can be arranged but sometimes it may be necessary for some pupils to secure land or arrange a project elsewhere than at home. The school plot often furnishes a most favorable means of providing the necessary land. In many cities or villages a number of vacant lots may often be obtained instead of a single school plot. Although the school plot is not absolutely required, as a part of an agricultural equipment it is advised that one should be operated wherever adequate provision can be made for its care during the summer months. For further suggestions as to the nature of these projects and methods of organizing them see under "Projects" and "School Plot."

g. For the complete success of the project work it is necessary that the agricultural teacher should be employed for at least eleven months of the year. This has come rapidly to be the common plan throughout the state. The season for the agricultural work is rather the farmer's season than that of the regular school year. During the summer the agricultural teacher should visit every pupil in the course several times for the purpose of giving direction and instruction in connection with the projects being carried on. At the same time the teacher should make a careful study of the farm conditions and problems of the community in order that he may be able to adapt the work of the course to these special needs. During such summer work it will be found easily possible for the teacher to make the acquaintance of the farmers and in a tactful way interest himself in their problems; let them know what is being attempted in the agricultural course and be ready to render assistance in a practical way wherever a favorable opportunity offers. Such acquaintance will be especially possible in the homes of the pupils. Teachers should avoid, however, the attitude of trying to show the farmers of the community how to farm. A far more effective attitude is that of one who is trying to learn what

he can from the experience of practical men and who is ready to enter into the work and problems of the farm on a common footing with the farmer. The most effective kind of extension or community work will grow out of this summer acquaintance and help, if these are tactfully extended. Get the interest of the farmers, however, rather through a spirit of comradeship and interest in their problems, rather than as an expert who is ready to show them how to do things.

Every agricultural teacher who is employed for the time in the summer when regular school is not in session, should keep a careful and full account of just how his time is spent each day and such report should be rendered to the school board at least once a month. School boards are especially urged in making contracts for the eleven months or for summer work, to require such a report for the time when school is not in session. Blanks for this report will be furnished by the state superintendent who should also receive a copy of the report. See Report Form, No. 9.

h. The number of class periods assigned to the agricultural teacher should be less than for most other teachers, since much field and laboratory work is required in connection with each agricultural subject. Furthermore, the planning and supervising of the projects will require a good deal of outside time. Five periods is strongly advised as the maximum for the agricultural teacher and in schools desiring the special aid the number must not exceed six.

The agricultural teacher should not be asked to take charge of such activities as athletics, debating, etc., which demand a large amount of outside time. These activities are certain to prevent the agricultural man having sufficient time to give to studying the agricultural interests of the community and to give proper direction to the practical work of the course.

**2. Legal requirements.** In addition to the administrative requirements enumerated above the following is a brief statement of the definite requirements of the law which apply to the agriculture as well as to the other special departments including manual training, domestic science and commercial work.

a. The course of study of the high school maintaining an agriculture department must be equivalent to the course of study prescribed for free high schools.

b. The special course must be approved by the state superintendent.

c. The special department must be a part of the public school system; that is, it must be under the direction of the board of education.

d. The teacher of the special subject must have a license covering the special work.

e. The scope and character of the work must be such as to meet the approval of the state superintendent.

f. The work must be maintained for a period of not less than six months during the school year for which aid is granted.

g. A report must be made by the clerk of each school board maintaining such department or departments to the state superintendent in such form as may be required, on or before August 1st of each year, setting forth facts as stated in the law.

h. Chapter 544, Laws of 1911, requires that all teachers of such special subjects must receive a salary of at least sixty dollars per month. This applies to grades as well as to high schools. However, an amendment passed in 1915, permits the hiring of one or more assistants to the regular legally qualified teacher, at a salary less than sixty dollars per month.

In order to receive special state aid for work in the grades in these subjects, the law provides:

a. That the grades must be connected with a high school giving the special work and under the management of the same board.

b. That the work must be given in the two upper grades below the high school.

Note: Town and union high schools have no grades connected with them even though they may be in the same building. Aid, therefore, can not be granted to grades under such conditions.

c. That it shall be subject to the approval of the state superintendent.

At least eighty minutes weekly must be given to the work in the seventh and eighth grades. A longer time is strongly urged and will probably be required in the near future.

The amount of state aid for each of these departments is now one-half the cost of instruction in that department, limited to three hundred and fifty dollars when the instruction shall have been given in the high school and the two upper grades next below the high school, or two hundred and fifty dollars when given only in the high school except that in commercial courses the aid is limited to three hundred and fifty dollars in the high school.

**3. Advisory Committee.** It is strongly urged that a special advisory committee of three be selected in connection with each agricultural department. Such committee should be selected by the agriculture teacher with the advice and approval of the school board. The committee should be made up of those in the community who possess greatest interest and who have had the most successful experience along agricultural lines. The teacher ought to confer with these men at frequent regular intervals about the general policy of the course, and should seek their help in locating the best agricultural materials for field study, such as the best crops, buildings and equipment, the most valuable herds and the best management. He should also ask their aid in devising ways and means of securing conveyances for field trips and in planning demonstrations and exhibits. Such a committee may frequently lessen or perhaps prevent unfair criticism by giving sanction and

assistance in field or project work which otherwise might be misunderstood and misjudged. Teachers should also avail themselves of the help and advice of county agricultural representatives wherever such are employed.

#### IV—COURSES OF STUDY.

**1. General course.** Before attempting to arrange the agricultural course, a careful study should be made of the requirements for the general high school course as given on pages 8-13 in the high school manual. As before suggested the general course for the agriculture department should be correlated as closely as possible with the special work and the general subjects should be so treated as to bring out relationships to farm problems as much as possible. See under "Administrative requirements."

**2. Special agricultural units.** The following suggests the subjects which have come very generally to be included in the course throughout the state. Experience seems to have confirmed the wisdom of the selection. A more extended outline and discussion relating to plans and methods of treatment of these subjects may be found under the heading: "Treatment of Subjects." It is expected in the administration of this course that special effort will be made to adapt each subject to the prevailing interests of each locality. For example, in regions where fruit raising is of large practical importance special emphasis should be placed upon horticulture as a part of the farm crop study. In the northern part of the state it would be wise to put more emphasis upon potato raising than upon corn. In some regions market gardening might call for more extensive treatment than elsewhere.

It should be noted that while elementary science is accepted as the agricultural subject during the first semester of the first year, a distinctly agricultural subject is given in the second semester. No course will be regarded as acceptable unless such an agricultural subject is included in the first year.

#### ARRANGEMENT OF AGRICULTURAL SUBJECTS.

FIRST YEAR	
<i>First Semester</i>	<i>Second Semester</i>
Elementary Science	Farm Crops
Farm Manual Training, 2 periods per week	Farm Manual Training, 2 periods per week
SECOND YEAR	
Farm Crops	Farm Animals
Woodwork or Forge work, 2 periods a week	Woodwork or Forge work, 2 periods a week

## THIRD YEAR

Farm Animals	Soils and Fertilizers
Mechanical Drawing,	Mechanical Drawing,
2 periods a week	2 periods a week

## FOURTH YEAR

Farm Mechanics	Farm Management
Cement Work, or Farm Building	Cement Work, or Farm Building
Construction,	Construction,
2 periods a week	2 periods a week

3. **Combination with the general course.** The following suggests a practical combination of the agricultural units with the general English course. In calculating the proportionate amount of time which the special teacher gives to the agricultural subjects the work in farm carpentry, woodwork, forge work and mechanical drawing may be counted as a part of the agricultural work. The addition of these subjects to the usual four subject program may be looked upon as a departure from a custom of some years' standing. However, it is believed that if work is presented in such a way as to interest pupils that there will be no difficulty in their accomplishing this much extra, especially since these subjects are of such a nature as to easily interest boys and, at the same time, call for a large amount of manual rather than exclusive mental effort. It is recommended that these subjects be given two periods per week instead of five and then carried through more than one semester. It is expected that spelling, penmanship and library methods will receive needed attention in general exercises, in the English and if need be in other studies.

## COMBINED AGRICULTURE AND ENGLISH COURSE

## FIRST YEAR

<i>First Semester</i>	<i>Second Semester</i>
English	English
Algebra	Algebra
Elementary Science	Botany, Elementary Science or Geography
Zoology or Botany	Farm Crops
Farm Manual Training,	Farm Manual Training,
2 periods a week	2 periods a week

## SECOND YEAR

English	English
General History	General History
Bookkeeping (Farm accounts)	Arithmetic
Farm Crops	Farm Animals
Woodwork or Forge Work,	Woodwork or Forge Work,
2 periods a week	2 periods a week



THIRD YEAR

English	English
Geometry	Geometry
Farm Animals	Soils and Fertilizers
Modern History or Chemistry	Modern History or Citizenship
Mechanical drawing, 2 periods a week	Mechanical drawing, 2 periods a week
*Domestic Science (for girls)	*Domestic Science (for girls)

FOURTH YEAR

American History and Civics	American History and Civics
Physics	Physics
Farm Mechanics	Farm Management
Reviews or English	Reviews or English
Cement Work, or farm building construction, 2 periods a week	Cement Work, or farm building construction, 2 periods a week
*Domestic Science	*Domestic Science

\*Domestic Science has here been arranged to meet the needs of small schools which wish to allow the girls to take agriculture during the first two years. It is perfectly satisfactory to have the domestic science given the first two years provided some other course besides Agriculture is supplied for the girls during the last two years.

4. **Course with one unit of agriculture.** High schools often desire to give one or two semesters of agricultural work without attempting to meet the full requirement for state aid. The following course is suggested to meet the needs of such schools.

COURSE WITH ONE UNIT OF AGRICULTURE

FIRST YEAR

<i>First Semester</i>	<i>Second Semester</i>
English	English
Algebra	Algebra
Elementary Science (Physical)	Botany
Zoology or Spelling Penn, etc.	Physiology
Manual Training, 2 periods a week	Manual Training, 2 periods a week

SECOND YEAR

English	English
General History	General History
Bookkeeping	Arithmetic
Farm Crops and Soils or General Agriculture	Farm Animals of General Agri- culture

## THIRD YEAR

English	English
Geometry	Geometry
General History	English History
Geography or Chemistry	Citizenship

## FOURTH YEAR

English	English
U. S. History & Civics	U. S. History & Civics
Physics	Physics
Reviews (Alg. Arith. Gram. Geo.)	Reviews or Economics

**5. Short Course.** This may be organized either under the "Agriculture and Domestic Science Short Course" law (section 496*c*-4), or under the so-called "Winter Term" law (section 494*a*). The former applies to schools already giving a special course and having a specially qualified teacher for the special subject. The course must be given for sixteen weeks and eighty minutes a day must be given to the special subject, that is, agriculture or domestic science, but no extra teachers are required, provided the work can be done by the regular teachers without overcrowding. The winter term law requires a separate department with an extra teacher employed for half the regular school year. In this course any subjects adapted to the needs of pupils may be offered and only general high school qualifications are required of the teacher. The first law offers \$200 special state aid, while the latter allows two-thirds of the extra teacher's salary. The winter term course has proved much the more popular of the two courses.

The following course has been tried out and has proved very successful. It may easily be adapted to the needs of either plan. The course covers two years, with sixteen or eighteen weeks work each year. Regular credit may be given for this work and pupils may be admitted to regular high school classes as soon as their qualifications, in the judgment of the principal or superintendent, meet the regular high school requirements. It is not expected that the need for this short course will be permanent in any community, since within two or three years it is probable that all students desiring such a course will have completed the work or will have cleared up back work so that they can enter regular high school classes, a thing which has resulted in a great majority of cases.

SUGGESTED COURSE.

FIRST YEAR			SECOND YEAR		
Subject.	Periods per week.	Credit.	Subject.	Periods per week.	Credit.
English—composition and literary reading.....	5	1	English—composition and literary reading.....	5	1
Business arithmetic.....	5	1	Business arithmetic.....	5	1
Elementary science.....	4	$\frac{4}{5}$	Elementary science.....	4	$\frac{4}{5}$
History.....	3	$\frac{3}{5}$	Geography.....	3	$\frac{3}{5}$
Civics.....	2	$\frac{2}{5}$	History.....	2	$\frac{2}{5}$
Agriculture or domestic science.....	4	$\frac{4}{5}$	Agriculture or domestic science.....	4	$\frac{4}{5}$
Penmanship.....	2	$\frac{2}{5}$	Penmanship.....	2	$\frac{2}{5}$
Spelling.....	2	$\frac{2}{5}$	Spelling.....	2	$\frac{2}{5}$

A credit as here used indicates a semester credit, two of which are necessary to make a regular high school unit. Spelling and penmanship should be required of pupils only until they show a good degree of proficiency.

A free opportunity should be allowed pupils to make elections according to their individual needs. A special effort should be made to adapt subject matter to the interests and capacities of pupils. The distribution of periods per week for the different subjects may be changed as thought wise, but those given are intended to suggest relative value and relationships. Furthermore, the plan of giving less than five periods per week to some subjects is thought especially desirable in this course.

The general science has worked out well as an introductory half unit to the special agricultural subjects as well as to the general course. Where elections are possible it is considered an advantage to give pupils half a year after entering high school before it is necessary for them to decide whether or not they wish to take the agricultural course. Furthermore, the general science is as valuable for girls as boys, serving as a splendid introduction to domestic science or to any other science work. Again, it is usually impossible to begin any project work, certainly in the line of farm crops, before the middle of the first year. It is thus easily possible with this arrangement of the course, to start the project work immediately as soon as the special agricultural subjects are begun.

It is considered a decided advantage to carry the farm plant life work through the plant season which determines the farmer's year, rather than through the school year. This arrangement makes it possible to link the work up much more closely with the actual activity of the farm and carry out a seasonal plan of treatment rather than one based wholly upon a supposed logical arrangement of sub-

ject matter. At the same time, it is possible to bring about the closest correlation between the project work and the regular class instruction.

In the course as formerly outlined in the high school manual, the soils work is given in the last half of the second year. This has been changed by substituting the first semester of animal study and moving the soils work to the last half of the third year. This is believed an improvement which works to the advantage of both subjects. The animal study, and especially the part dealing with the dairying and poultry study, has a special advantage in the earlier part of the course because of its ready appeal to the practical interests of young high school pupils and because of the interesting nature of the projects, field work, etc., in this line. This is especially true because of the natural interest of young people in the companionship and activity of animals and also because of evident economic values which are quickly realized from animal projects such as the keeping of a flock of poultry, the testing of milk or the raising of a calf or pig. Again, if it is necessary as it is in some small high schools to have the girls take the agriculture through the first two years of the high school course, the animal work is far more interesting and profitable to them than the soils.

There is advantage also on the side of the soils in having this topic placed farther along in the course. This subject though very important, is yet one of the most difficult in the course to present in an interesting and effective way. Greater maturity on the part of the pupils and larger general training especially along the science lines, helps decidedly in making the presentation of this topic easier and more effective. There seems little question but that the senior year offers the best place for the presentation of the farm mechanics and farm management.

A word further about the two periods a week in manual training, mechanical drawing, etc., which has been suggested throughout the course. These lines of manual work are interesting to all high school boys but especially to boys just entering the high school. They are generally so eager to do such work that they are ready to spend much time beyond that regularly required in completing projects in hand. It is not believed that the three hours a week called for in addition to the time devoted to the regular four units of work will prove an over burden to any student, while on the contrary the work will not only have the greatest practical value in connection with agriculture, but will serve as an especial aid in interesting pupils in the course at its very beginning as well as give a valuable training irrespective of the agriculture.

In schools having manual training departments it ought usually to be possible to provide special classes for the agriculture pupils, but if not, it ought not to be at all difficult to differentiate the work for different pupils so that agriculture pupils and others may carry

along their work together. In the smaller schools where no manual training course is offered, two or more benches and sufficient space, either in one part of the agriculture room or in some other convenient place, should be provided for the carrying on of this work. Mechanical drawing tables or desks can usually be made by the pupils. It is strongly urged that all schools giving the agriculture course provide one or more forges for carrying on the forge work. Some place in the basement can usually be found for the cement work. In one school in the state a cement block shop has been erected by the agriculture pupils. In this shop carpentry, forge work, mechanical drawing and cement work are all provided for.

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## V—GENERAL METHODS AND LINES OF WORK.

**1. General Plan.** The general plan of work should include the following lines:

**a. Field work** in which provision is made for a first hand study of the best agricultural material in the community,—e. g. selecting seed corn from a field, studying a local dairy herd, visiting a fair or poultry show, studying and setting up farm machinery at the warehouse of some dealer.

**b. Observation and experiment** in which proper laboratory instruction should be given with materials in the hands of pupils so as to furnish an adequate basis for an understanding of the principles of the subject.

**c. Class instruction** in which the assignment of definite lessons should be combined with teaching, testing and drilling in such a way as to insure adequate organization and application of the facts and principles of the subject. A good text should usually serve as a guide and as a chief source of information.

**d. Practical projects** in which actual farm practice is carried out in such a way as to secure a productive result which should be accompanied by a systematic account. Such projects may include school or class projects and home or individual projects.

**e. Contests and exhibits** which may be arranged in connection with local fairs or exhibits, but best of all in connection with a "Harvest Festival" program for the whole school. At this time there should be an exhibition of products resulting from the projects and a general rounding up of the productive side of the work in such a way as to impress pupils with the worth-whileness of the work and appeal to the interest and pride of the whole community in the results of the course.

**f. Manual training** work related to farm needs, such as farm carpentry, forge work, mechanical drawing, cement work, and farm

building construction. These have been especially provided for in the course and will be outlined under treatment of subjects.

**g. Community or extension work** such as institutes, farmers' exhibits, short courses, coöperative plans among the farmers, etc., operated in the interests of the whole community.

**2. Field Work.** The field work is of special importance in this course. The purpose should be to utilize for study the best agricultural materials and methods of the locality. Furthermore, pupils should by all means see the application of what they are studying at school to the actual conditions of the farm. Pupils living on the farm have, of course, an acquaintance with many things and a knowledge of common practices, but it is of the utmost importance that even such pupils should have large opportunity to make applications under the direction of the teacher, and also that all the pupils should have a chance to observe the best things that can be reached in every line.

In many cases the main business of a field trip would be the observation and study of materials or methods related to the instruction work. The following are mainly of this sort: studying a dairy herd, observing any pure bred stock, visiting a fair, a poultry show or other exhibit, visiting a creamery, visiting a seed house or feed store, visiting gardens or greenhouse, studying the landscape work in a park or yard, studying the construction of the best barns and buildings, visiting a demonstration farm or orchard, making a trip to a machinery warehouse, visiting stockyards, observing results of liming soil, observing new and improved varieties of grains. In other cases, there may be a definite piece of work involving the best practice, which should actually be done in the field or on the farm, under the direction of the teacher. The following are examples: judging stock at farms, at stockyards, at stables or at any stock exhibit, spraying fruit trees, selecting corn in the field, selecting and judging potatoes in the field or at a warehouse, collecting weed and grain samples, collecting insect materials, treating plants for disease, gathering data for farm management problems, setting up machinery on the farm or at a warehouse.

This line of work should be regarded as a very important and essential part of the plan of developing each subject. It should not be looked upon as outside or as supplementary work. The farm and the field furnish the most important laboratory of the course, through this must be supplemented by considerable inside laboratory work. It is the business of the agricultural teacher with the help and advice of the principal to arrange a program which provides for this work. As far as possible it should be done at the time assigned to the work on the daily program. Where more time is demanded the class may be excused at the regular hour and a time arranged after school or on Saturday. It may be necessary

to have pupils excused occasionally from one or more classes in order that they may get in a trip which is difficult to arrange in any other way. The principals of schools having this department should see to it that sufficient flexibility is allowed in the general program to make these trips possible for the agriculture class.



STOCK JUDGING AT DODGEVILLE HIGH SCHOOL.

Sometimes a half day trip may be necessary. It is helpful to arrange the program of pupils in this course so that their general course work comes in the morning as far as possible, and the agriculture in the afternoon. It should not, however, be felt or understood that the field work is extra and must be done in addition to the work of the regular periods. Needed field work is a regu-

ular part of the work and regular time should be used for it so far as the nature of the trips will permit.

Many of the field trips may be within easy walking distance but where it is necessary to go farther the provision of suitable conveyances becomes an important problem. It has frequently been found possible to provide these through the boys in the course who are able to furnish autos or other conveyances. In other cases owners of pure bred stock or other farm equipment are often glad to drive in to take the boys out to their farms. Often owners of automobiles who live near the school and who are interested in the course are willing to donate the use of their machines for long distance trips. It will not often happen that railroad transportation will be necessary for any trip. However, occasionally some such trip may be of unusual value. In such cases it will generally be the best plan to expect each pupil to provide for his own personal expense. However, school boards have sometimes been willing to provide money to meet such needs. In still other cases classes have earned the money through some form of school activity. It is the business of the agricultural teacher to work out in coöperation with the pupils ways and means for carrying out an effective program of field work.

In all the field work the fullest coöperation should be sought especially of the advisory committee. At the same time, there should be an effort made to secure the coöperation and help of farmers and others in the community, not only in securing conveyances for field trips, but also in locating the best things and in securing valuable demonstrations. The most effective kinds of extension or community work usually grows up through such coöperation. Likewise, community interest and support are very much increased.

As a regular part of the work, the field study demands as careful planning and as systematic direction as any other part of the work. Generally some preliminary study or discussion is necessary to give a clear idea of the purpose of the trip and to raise questions and problems for study. It is very desirable that an outline of these questions should be placed in the hands of the pupils. These may be mimeographed or copied by the pupils in their notebooks. There is also need for frequent class discussion during the trip to see what pupils have observed and whether they are working out the problems in hand. If it is found that some are failing to give concentrated attention or have their minds on other things, they can be required to review their observations and study the questions further while the material is still at hand for study. Each pupil should keep careful notes on the results of the trip. Such notes should be put into some good tabulated form wherever possible and the whole should be put into good shape and made a part of a permanent record. Such notes are more



valuable than many of the tedious notes which are often required in connection with inside laboratory work. If pupils are made to feel that an intelligent written account will be expected, showing results of problems worked out, they will be strongly stimulated to give business like attention and to round up definite results. It is only through accurately recorded observations of this kind that the work may be given real scientific value. The teacher will have no more important problem in the work than that of organizing strong teaching work in connection with the field trip. The haphazard, good time sort of trip which is so easy to fall into, should have no place in the work of this course. For further suggestions on students' notes see under "Notebooks."

**3. Laboratory Experiment and Observation.** This work should be very closely related to the field work. Much of the material observed and collected on the field trips demands a more careful study than is possible in the field. Such study should be carried on in the laboratory with arrangements so that students may be seated about tables with material in hand and with suitable apparatus for the work. Such work should have the most careful direction from the teacher. The problem is not one of working out by the aid of some laboratory manual a standard set of experiments which has been formulated by some specialist who has little knowledge of the pupils or of vital problems in the locality. Such manuals may be very helpful in giving suggestions and in describing reliable methods for the help of the teacher, but in the hands of the pupils they are likely to result in a blind and unintelligent following of directions without any real motive and perhaps no appreciation of any principles involved. Such manuals in the hands of pupils tend likewise to develop an irresponsible if not a shiftless attitude on the part of the teacher toward this phase of the work.

What is needed for effective laboratory work is the most skillful kind of teaching while the pupils are at work with material in hand. In fact the laboratory work to be effective must constitute a closely related and inseparable part of the complete method which culminates in the formal class exercise or so-called recitation. There should be a free opportunity to organize the class for discussion at any time during the laboratory period and likewise questions should be referred back frequently from the class discussion to the laboratory for further experiment or observation.

It is of the utmost importance that the laboratory study should arouse the pupil's best and most concentrated thinking. Much current laboratory work fails utterly to do this for the reason that it lacks any purpose or motive which appeals to the pupil. It has been said that the first step in any good thinking is a problem in the pupil's mind which to him is worthwhile. This means a definite problem, an intelligent understanding of it by the pupil and a motive for working it. Problems grow out of the experiences and

situations of life. The trouble with the usual laboratory manual method is that the problem of an experiment has no connection with the pupil's experiences, but is made by the teacher or specialist and imposed upon the pupil according to some supposed logical order for the mature mind. Often this supposed order is only confusion to the pupil. Either he does not see the problem at all and therefore goes blindly at work to follow directions or, if he does see the problem, he sees no connection with his own experiences and therefore has no motive, unless an artificial one, for trying to work the experiment.

Again the next step in any good thinking after having a problem and a motive for trying to solve it, is to begin to think out a method of working it. The laboratory manual wholly deprives the student of this step and not only imposes the problem upon him and depends largely upon an artificial motive, but it imposes also a complete method for the solution. What is needed is more laboratory teaching and less turning of students loose in the laboratory to work out tasks imposed from without. There should be more use of the laboratory for working out of problems which have been formulated by the pupils themselves out of their own experiences, under the guidance of a teacher who has an understanding of what problems are useful in developing the principles of the subject.

A line of procedure based upon the above considerations would proceed somewhat as follows: First, pupils are organized as a class about tables in the laboratory, with material for observation or experiment ready at hand. Then the teacher begins a preliminary study in which pupils are asked questions concerning their previous experiences along the line of the topic of the day. Natural situations and common experiences are brought before the class and out of these the teacher by skillful questioning will lead the pupils to formulate many problems which are full of vital interest to the pupils because they are the outgrowth of actual experience. A skillful teacher will even seek for those things which especially interest pupils by such questions as this: "What things are there in the line of this topic which you would like to find out?"

When these problems have been raised and interest has been stimulated, then the next step is to select certain problems and by further questioning lead the pupils to work out a method of solving these problems. Of course, pupils cannot be allowed to waste time in trying out every line of their suggestions, but by wise direction on the part of the teacher pupils are led to see the defects in their suggestions and a workable method of procedure is finally agreed upon. Some of these questions may call for careful observation of materials at hand or certain experiments may need to be performed. The observations as well as the experi-

ments should follow the problem method. Questions by the teacher drawn from common experience should furnish the motive to direct the observations. Pupils themselves should be stimulated to ask good questions.

To illustrate suppose "a study of the corn seed" is the topic of the day. Questions like the following should mark out the approach in the study of this topic: What must a farmer provide in order to raise a crop of corn? Why does he test his seed? What difference between a kernel of corn that will grow and one that will not? (One is alive and the other is dead). How important is this difference? If this seed is to produce a young corn plant what would you naturally look for in the seed? What parts does a young corn plant have? See if you can find corresponding parts in the young plant within the seed. What is necessary to make a pig or any other young animal grow? What would this young plant have to have for growth? Before the roots of the young plant become fixed in the soil, how is the young plant going to get food? See if you can find out where this food is stored in the seed. If a young corn plant is pulled out of the ground what happens to it? Why? Find out how the young corn plant in the seed is protected from wilting and drying. What happens to a person who is deprived of air? How does this young plant in the seed get air? Find out how the young plant in the kernel of corn is connected with the food supply. In some seeds the food supply is in this part which is connected directly with the young plant. Now would you like to know what the botanist calls these parts so that you can speak about them accurately and quickly? Why have names for things? We shall have drill on these names till we get them well associated with the parts to which they belong. (Give a large amount of such drill.) Find all of these parts using soaked as well as dry seeds. Find the parts in sections of the seeds. How many different sections can you make? Make some rapid sketches to show parts and label each neatly. Study a bean seed in a similar way and then write a comparison showing similarities and differences. It will be observed here that development of knowledge has been by meeting a problem at each step and working this out by reference to previous knowledge or to new observations. The illustration may be taken as typical. Modifications of it will be necessary, of course, in special cases, but the general method is fundamental to good laboratory teaching. Questions and problems may sometimes be worked out best by observations or simple experiments at home or by a visit to some field or shop. Frequently, however, experiments readily adapt themselves to laboratory manipulations. Sometimes, the whole class may work the same experiment, but in many cases different individuals or different groups may work different experiments. After the work has progressed to a stage where a convenient unit of work

has been completed the class may be called together for further discussion to find out whether work has been properly done and whether good thinking has accompanied it. After full discussion some things may profitably be put into good form in a notebook and perhaps some sketches made. In some cases the field trip will furnish the most effective means of providing experience at a certain stage. This should be conducted with the idea of making it a teaching exercise on the same plan as already outlined.

#### THE PUPIL'S NOTEBOOK.

Each student should keep a careful notebook in which should appear an intelligent record of what has been learned in connection with the laboratory and field study. Such a book should serve the practical purpose of furnishing a memorandum for the pupils' future reference and also as evidence to the teacher that the pupils have made the study required and have gained correct ideas. Very little information taken from books or from other sources outside the pupils' own direct observations should be included. In all cases where such material is included as a help in giving needed explanations, the source of such information should be indicated. Elaborate organization of subject matter in the notebook is regarded as a great waste of time. Long and tedious tabulations and the filling in of formal outlines should usually be avoided. The notebook should show in a direct and intelligent way just what the pupil has observed, what thinking he has done and what interpretations and conclusions he has reached.

Such an account may take the form of description or discussion, but frequently may be in the form of suitable drawings or sketches. Such drawings should be neat and give an accurate idea of the object or objects represented but they should at the same time be made rapidly. This form of drawing is a means of expression rather than a means of making an attractive drawing for exhibition or publication. Laborious and tedious drawings with great attention to minute details should be especially avoided. Frequently a sketch or drawing may take the place of considerable description. A neat tabulation for all numerical data is desirable, but too intensive and technical tabulation should be avoided. It must be remembered that the usual high school student has very limited ability as a statistician.

It is especially important that good notes should be kept on the field trips and in connection with the home projects. The tendency is very strong to make the field trip a kind of holiday excursion in which the jolly good time spirit has chief prominence. One of the best means of holding pupils to definite work is to expect of them well organized notes on the work. On the other hand, it cannot be too much emphasized that nothing can more easily

dull and destroy interest and enthusiasm in science work than tedious and irksome notes and drawings in connection with laboratory work.

The loose leaf notebook is recommended as having many advantages, and the use of uniform covers for all students is very desirable. It is sometimes a convenience to have pupils supplied with a small pocket notebook for use on field trips to avoid getting regular covers worn and soiled. The field notes may then be transferred to the regular book. However, the general practice of rewriting notes is not to be encouraged. It results in too great a sacrifice of time and furthermore, it is important that the habit of making usable notes at the time observations or experiments are carried out should be cultivated.

The notebooks should be inspected occasionally by the teacher. This inspection should be more frequent in the early part of a term or semester in order that pupils may at the very beginning learn to make good notes. The pupil should be made to feel that the notes are for his own benefit rather than for the teacher. The habit of marking notebooks by weeks or even by months and then letting the notebook record count as part credit on the course is a bad practice, which usually stimulates pupils to copy work from others or to hand in reports of work not actually done. Furthermore, the notebook often gives a very false idea of the actual merits of pupils' work. The tendency is to develop exhibition notebooks which show very little of the real value of the work. Again, the slavish habit of looking over and grading great piles of notebooks is likely to consume far too much of the conscientious teacher's time. At the same time, the teacher should see to it that notes are neatly kept, that they show evidence of faithful work and that good habits of English are followed. The problem of developing good English in the high school is just as much a duty here as in the English classes.

**4. Class Instruction.** As has been stated, this follows as a natural and inseparable part of the method begun in the laboratory outlined above.

When a convenient amount of laboratory work has been rounded up in this way, then a textbook lesson may be assigned in connection with a review of all the laboratory work. The text furnishes fuller authoritative information and helps the pupil to organize all his knowledge about certain principles and more general ideas. In the next class period the teacher helps pupils in this organization by questions which stimulate further thought. At the same time the pupils can be held for knowledge gained from the book. Still further, wider understanding can be developed and practical applications can be made. In this exercise, when ideas have been fully worked out and are clearly understood, technical names, whenever needed, may be presented and the teacher may assist pupils in forming a close association between these ideas or structures and the terms which are applied to them. Finally, definitions may be formulated and formulae worked out, provided these are not too technical. It will be observed here that definitions and

formal statements are the final and not the first step in organizing and rounding up a topic. By far the most common method of recitation observed in most classrooms is the exact reverse of that outlined here; that is, definitions and abstract statements are called for at the beginning instead of at the end. After these are stated by pupils the teacher then asks to have them illustrated by concrete examples. It will be apparent that this common method compels the pupil at once to fall back upon his memory of what the book said. This textbook plan is especially poor in meeting the needs of the agriculture work. Mere reciting of textbook knowledge, especially in this subject, is likely to result in lifeless, parrot-like work which develops little or no interest and which has small value. Agriculture above all other subjects, if it is to have any vocational value must rise above this method.

A further step in the complete program should consist of review and summary in which good organization of knowledge is insisted upon and in which adequate practice and drill are given to enable pupils to gain as large a mastery as possible of the material.

A final step in rounding up any topic may consist of the assignment of special supplementary topics which call for more extended study of available sources of information, along the line of the most practical phases of the subject. These assignments furnish one of the very best opportunities to adapt the work to the varying interests and capacities of the students of the class. For this reason the teacher should aim to let each pupil select topics along the line of his leading interests. Furthermore, many of these topics will be suggested by problems which have been raised in the class discussion.

While mere reciting out of a textbook should by all means be avoided, a good textbook should nevertheless be placed in the hands of the pupils and made the basis of the work in each subject. Bulletins and other references may then be used to great advantage as supplementary material. Without a text, the work in the hands of the ordinary teacher, is likely to be indefinite, disconnected and unsatisfactory. There is, furthermore, an advantage in the thorough acquaintance with a standard text which comes by continued use and which is lost by too frequent changes. In the use of a text, however, teachers should be constantly on their guard that the work shall not be made too technical and difficult for high school pupils. The injurious effect of this error in the past in nearly all lines of high school work and especially in science are generally recognized and there should be earnest effort to avoid this mistake in this new subject if it is to be made vital.

For both the laboratory work and for the more formal class instruction there should be a good supply of illustrative material. Such materials should include materials brought in by pupils or teachers for temporary use, mounted specimens, pictures, charts, farm utensils, etc. A lantern with a good collection of slides is also a most valuable help in making the instruction concrete and real. Every school giving this course should have a special room and cupboards provided with suit-

able shelves and drawers where such materials may be gathered together and arranged so that they may be quickly available for use. See under "Equipment and Illustrative Materials" for further suggestions along this line. See also comments on "Field Work," "Laboratory Observation and Experiment" and "Recitation Work" under Botany and "General Statement" under Science in the high school manual.

The so-called lecture method should have small place in secondary school work and especially in the subject of agriculture. High school pupils have little power of getting definite knowledge in this way and few teachers are capable of holding interest or attention in material thus presented. The conference plan with the give and take of questions and discussions, based on assigned lessons, furnishes the most stimulating atmosphere for good thought as well as for holding pupils for definite preparation and results. Pupils themselves should be encouraged to ask questions and originate discussion provided this is done in the right spirit. It is likely to be especially wasteful of time and energy to attempt to give pupils information or directions by the dictation of notes. A small amount of this may sometimes be needful, but it should usually be avoided.

The dictation of material from the college notes of the teacher is likely to be particularly ineffective. Such notes are in nearly all cases too technical and intensive for the use of high school pupils. Though such materials may occasionally be valuable in a high school course, they should in nearly all cases be considerably modified to adapt them to the interests and capacities of these pupils as well as to the local conditions. Even most high school books and plans of work are likely to be too technical and too difficult. Teachers should therefore be particularly careful to see that any material taken from college sources should be made simple and practical, when used for high school pupils.

While the teacher should use the lecture method very sparingly he should nevertheless be ready to make his contribution to the discussion. The common criticism that teachers talk too much does not exactly hit the real difficulty. It is rather the truth that they talk at the wrong time. A good teacher will use every means to get pupils to make the fullest possible contribution to the topic in hand, being especially careful not to interfere with the fullest expression. However, when the knowledge and ideas of the class have been fully rounded up, and the best possible expression has been developed, then the teacher has one of the finest opportunities of the classroom to add his contribution and from larger experience and a fuller command of the subject, add new illustrations, fill in the gaps and give students a large and inspiring view of the whole topic.

The inexperienced teacher is in danger of weakness both in the matter of giving each pupil too little chance or of helping the pupil too much, and in failing to make suitable contribution himself. When any pupil fails to make a satisfactory answer, the young teacher is too apt to give the information himself or pass the question on at once to

other pupils, when he might by skillful questions and by the use of familiar situations, lead the first pupil to make a much larger contribution from his own knowledge. Frequently pupils fail to get credit for what they know perfectly well because the teacher's question puts the thing in an unfamiliar and perhaps also in too technical a way. On the other hand, the inexperienced teacher too often fails to give any contribution at all himself, accepting scrappy and inadequate answers, failing to correct inaccuracies in answers given, doing little incisive questioning, and leaving the whole topic vague and confused.

There is often need, furthermore, that pupils should be required to defend their ideas against opposition. For this reason, the teacher should not give too ready assent to the pupils' answers, but rather hold approval in the background and sometimes even present objections in order to lead pupils to clarify and establish their answers or for the purpose of bringing out the weaknesses of replies. It is desirable that a wholesome spirit of questioning and debate should be aroused in the whole class, so that pupils demand of each other adequate proof or evidence of points in hand. The class thus comes to have the conference spirit where the teacher acts as leader and where each one is ready to make his contribution in gaining the fullest mastery of the subject in hand.

There is need also that the recitation work should include vigorous testing and drilling on the work covered. In the testing, pupils should be held for definite, accurate and well organized knowledge. Much of this may be done in connection with the teaching development, by asking questions which demand not only good thinking about familiar situations, but also information supplied in the assigned lesson. A skillful teacher will find out whether pupils have made adequate preparation by testing their ability to select needed information gained from preparation of the lesson and to apply this to some problem in hand, rather than by bookish questions which call for reciting wholly or even in large part from memory of what was stated in the book. Altogether too much reciting is this memory kind with no problem to stimulate thought and little motive to arouse interest. While much testing should be done in connection with the teaching, there should also be some special attention given to testing and review. It is a good plan to devote a little time to this early in the recitation, at least several times a week before the advanced lesson is taken up. High school pupils are not sufficiently mature so that they can be depended upon to do sufficient reviewing and testing of themselves outside of class.

The need of adequate drill work needs to be emphasized especially. High school teachers are altogether too apt to copy after college or university methods here and give entirely too little attention to good devices for drill work. Whether enough drill work is done in college classes need not be discussed here, but whatever may be said on this question, it is certain that good drill work is neglected in most high



schools. The plan in the high school should be patterned after methods found effective in the grades below rather than after college methods. Devices should take advantage of well known methods of arousing interest. Drill exercises should first of all be snappy and vigorous, so that the very activity itself will arouse enthusiasm. Again the spirit of rivalry and the play instincts may be appealed to as a means of getting the most concentrated attention. At the same time it should be remembered that the fixing of knowledge permanently in mind depends upon good attention, establishing many familiar associations and frequent repetition or application. A good variety of drill devices should also be employed in the drill work.

Much of the work in all the agriculture subjects, as well as other high school subjects, involves the gaining of familiarity with new terms or expressions. The use of technical terms should be avoided wherever simpler terms can be used but many new terms are absolutely necessary as a part of the language of the subject. Familiarity with these terms is necessary both in presenting accurate ideas to others and likewise in understanding the thoughts of others. In order that the pupil may acquire facility and skill in the use of the language of the subject, it is necessary that there should be an instant and accurate association in his mind between each term and the idea or object to which it belongs.

A good deal of drill and practice is demanded in gaining this familiarity and in establishing these associations. Without such familiarity both knowledge and expression are hazy and confused. In many cases pupils appear to be wholly ignorant on certain topics, whereas the ideas involved are perfectly familiar. They seem ignorant simply because they have no understanding or mastery of the terms and language employed in giving full and accurate expression to these ideas. What is needed is a thorough drill in a mastery of the necessary language. For example, many boys might know a good dairy cow or a good horse, but be unable to point out the points of excellence or show in what characters the animal excels. In order to be a master of the whole problem, the boy must understand the names of the parts and the terms commonly employed to describe them and gain skill in the use of these to express his ideas. It cannot be impressed too strongly upon the high school teacher of agriculture that a large amount of vigorous and snappy drill work is needed with the use of the best possible devices, in order to give pupils intelligent mastery of the work. This applies with special emphasis to such topics as—parts of a dairy cow, parts of a horse, classes of animal foods, constituents of milk, breeds of poultry, identification of weed specimens, etc., but it applies also to practically all of the topics dealt with in the classroom.

In order to show more definitely how effective drill work may be conducted, the following exercises are suggested:

**1. Parts of a dairy cow.** Take up this study first with a good chart before the class showing parts and names of the animal. Such

a chart should be on hand as part of the equipment, but if not at hand, a drawing may be made by some member of the class. Have some pupil first point out the parts giving the name of each. Be sure that it is understood to exactly what part or region each name applies. Have a number of pupils name these over demanding a little greater speed each time. Now let the teacher take the pointer and go rapidly over all the parts asking for concert answers. After this test individual pupils keeping a record of the number of mistakes made. Place the record on the board. Stimulate good natured rivalry on the part of pupils to make the best record. Do not expect to fix all the names the first day. Repeat this vigorous drill for a short time on many different days. Such a plan of drill is far more effective than long continued practice on the same day. In fact, improvement is possible at one time only up to a certain point. Beyond this point further drill may be positively harmful because it fails to hold attention and may result in confusion.

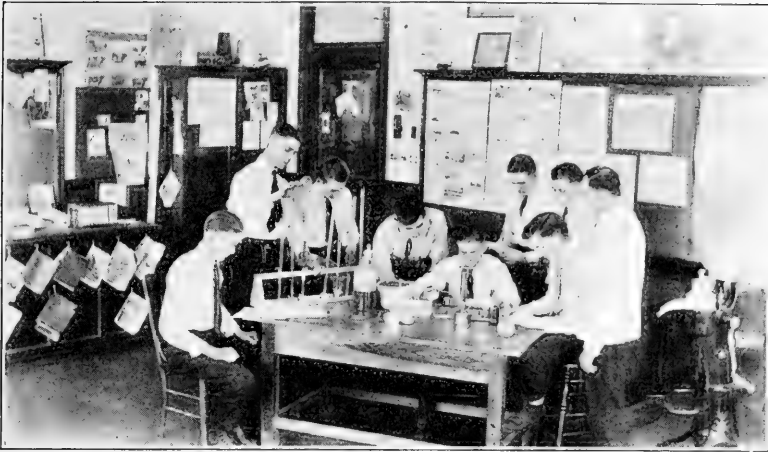
**2. Acquaintance with weeds.** First take a trip with the class to some nearby field or roadside. Collect and name as many weeds as possible, noting distinguishing characters of each. It is well not to make the list too large the first time. Have pupils consult available books on weeds in an effort to find the names of any specimens not known in the field. The teacher should give such help as is needed in this identification.

At the next recitation period gather the pupils about tables with specimens in hand for a study of the characters of each specimen. Next begin drill work for the purpose of fixing names and characters in mind. Take a set of specimens, say twenty-five, and holding one at a time before the class, ask for the name and one or two distinguishing characters of each. Call for concert answers at first and then test many individuals, stimulating as before rivalry in getting the largest number right. Many mounted specimens ought to be available for use in this work. Fresh specimens may also be used. Repeat this drill exercise at the opening of the period on many different days.

Such exercises should be made use of in connection with a great variety of topics. The greatest enthusiasm may be aroused if good devices are used and the work is made vigorous and good natured.

## **5. Practical Projects.**

**a. Purpose and Importance.** The practical project is regarded as the most essential part of the agriculture work. Unless opportunity is provided for pupils to work out some actual worth-while farm practice there is likely to be little motive in the work and results must be largely a failure. Such laboratory work as is usually carried on in connection with the science subjects of the high school is not enough, although some of this is needed. The farm and the school plot wherever feasible, must constitute the main laboratory for this work. It is the business of the agriculture course to furnish opportunity for practice, as well as instruction, in the best methods of the farm in the same way that domestic science courses provide for practice in baking



LABORATORY WORK AT GREEN BAY, WEST SIDE. NOTE CHARTS AND OTHER ILLUSTRATIVE MATERIALS.



FILLING THE SCHOOL SILO AT WEST SIDE, GREEN BAY HIGH SCHOOL.

the best bread, cooking meat in the best way or making a good dress. A definite line of projects is demanded in the agriculture course just as much as projects involving the actual construction of things by the use of tools is required in a manual training course. Without the project, the work must lose most of its vocational or prevocational value since the pupil has little opportunity to determine his aptitude and taste for this line of work unless he has a chance to try out actual problems and practice in connection with his instruction. Tin can and pot experiments or even small plot demonstrations, useful as these may be, cannot give this vocational outlook. The boy must actually work out some practical result which appeals to him as worth while. It will seem worth while to the boy in exactly the same way that it does to the man, that is by the producing of a good crop and getting a good financial return or an added attraction or comfort in the home. Other values might be mentioned but need not be discussed. It is only necessary to repeat what was previously stated under "Administrative Requirements," *that it is now a definite requirement of the state department that a systematic and well organized plan of project work must be carried out with all the students in the agricultural course during each year of the course, in order that state aid may be granted.*

**b. Scope of the Term.** The term "project" is here used to include any piece of actual farm practice carried out over a long enough period to realize a definite and complete result. The realization of a financially productive result should be the aim of most projects, though this is not always possible or even desirable. As to the time element, projects have been classified as short time, medium time and long time. Often the short time and medium time projects may be regarded as merely stages in the long time project. Again, some short time and medium time projects may be regarded as "exercises" which should properly constitute a definite part of the classroom instruction and laboratory work, as for instance, making the Babcock milk test, selecting and curing of seed corn, treating seed for disease, germination tests of seed, etc. Such work should be given as a part of the demonstration work at school and should also be encouraged as much as possible at the homes of the pupils. Possibly some school credit should be given for such home work, but these exercises alone do not constitute a satisfactory plan of project work.

The United States Department of Agriculture has given the following essential conditions for such project work: "(1) There must be a plan for work at home covering a season, or a more or less extended period of time; (2) it must be a part of the instruction in agriculture of the school; (3) there must be a problem more or less new to the pupil; (4) the parents and pupil should agree with the teacher upon the plan; (5) some competent person must supervise the home work; (6) detailed records of time, method, cost, and income must be honestly kept; and (7) a written report based on the record must be submitted to the teacher. This report may be in the form of a booklet."

Each student in the course should carry out one or more such projects during each year of the course. Crop projects must necessarily be carried on during the growing season, but the animal project can usually be managed mainly during the winter season. A very good working plan is for each pupil to operate a crop project in the summer and an animal project in the winter. These may overlap but the two can usually be handled during the same year. This works out particularly well with the course of study as it has been presented in this bulletin. A crop project may be begun at the beginning of the second semester of the freshman year and carried along parallel with the instruction work in "farm crops." This project may be rounded up in time for the fall festival and exhibit during the first semester of the second year.

An animal project may be started in the fall at the time of starting the work with "farm animals." The dairying and poultry work furnish the best projects at this time thus making it possible to connect the project very closely with the instruction. The sophomores can then start another crop project in the spring and perhaps carry also an animal project either the one started in the fall or a new one, along at the same time rounding them both up for the fall exhibit of the junior year. Soil and farm management projects can then receive main attention during the last year of the course.

**c. Relation to Classroom Instruction.** However near the plan can be made to follow that just outlined, every effort should be made to connect the projects as closely as possible with the classroom instruction. The project thus helps all the time to furnish not only the motive and the vocational outlook, but also the concrete basis for the instruction which would be largely meaningless without the practical application furnished by the project. A greater interest is aroused in this way and the theory and principles presented in the classroom find constant verification in the art or practice as carried out in the project. It is only through such correlation that the work can be made truly educational, so that the scientific habit may be developed in connection with all farm practice.

**d. Relation to the Parent and the Home.** It has already been indicated that the parents' interest and coöperation should be secured in the project as far as possible, both because of the help the parent may give in supplying land, seed, equipment, etc., and because of the stimulating effect which this interest and coöperation may have upon the parent in getting him to study the problems involved and in convincing him of the value of the best practice. The project thus becomes a most important bond between the home and the school instruction, between the school and the community. In fact, it is the only possible way by which an agricultural course can secure any vital or active community interest except in the most general sort of way. The problem of securing

the hearty coöperation of parents in this work is a most important one, often calling for the most tactful management on the part of the agricultural teacher.

It is in this connection that a preliminary survey of the community by the teacher is most valuable. If before school opens or early in the year this teacher can spend some time getting out to the homes of patrons with the idea of getting acquainted personally; of studying the local community problems; of gaining the confidence of the community, and of letting the people know what is being planned in connection with the agricultural course, an immense advantage may be gained in getting the best coöperation in the project work.

**e. The Home Project.** Projects may be considered as home or individual and school or group projects. Of these the home project is regarded as most important. It has the advantage of linking up closely with the home and of thus helping the instruction work to actually function in the activities of every day life. At the same time the benefits not only reach the pupil but also the parent and the home. Wherever land can be secured on the home farm or in the home garden, this furnishes altogether the best place to carry on the project. Where pupils cannot secure land at home it is the business of the agricultural teacher to find some other way of securing it for such pupils. Such land may be secured from the school plot or sometimes from vacant lots in cities or villages.

Real estate men are usually glad to coöperate with the school in donating or in securing the use of such plots. Some boys in the agricultural course hire out for the summer on a farm or elsewhere, others may leave home on vacation trips. In such cases, projects should be selected and cared for till the close of school and then each student should be held responsible for providing in some way for the work while he is away. If he has to hire some one, this should be counted as one of the items of expense connected with the project. Another possible plan for boys who hire out, is for each to organize some project in connection with the work he is called upon to do on the farm.

A financial account should form an important feature of each project. This account should show size of plot, materials used, character and amount of labor, together with costs, receipts and profits. A prize essay contest based upon this work, would arouse special interest and would be valuable work to be carried on in coöperation with the English department. Some "Prize Letters" of a somewhat similar nature are published in Hoard's Dairyman for March 13, 1914. Somewhat longer essays might be desirable in this work.

The following list of projects offers a variety of lines from which may be selected those best suited to individual and local needs: Nearly all of these have been actually carried out in the Wisconsin

schools, though of course not all in one school. A rather full list is given so as to offer a wide range of selection and also to help provide for varying interests in individual pupils and in different communities.

#### PROJECTS WITH FIELD CROPS

1. Growing an acre or less of corn. One acre is a standard area but results on a smaller area may be figured out to the acre unit.
  2. Growing pure bred grains on a given area.
  3. Growing potatoes on a given area,  $\frac{1}{8}$  of an acre or more.
  4. Developing a plot of alfalfa.
  5. Carrying out an ear-to-row test of corn.
  6. Testing hill selection of seed potatoes.
  7. Selection, curing, testing, grading and selling of seed corn.
- A group of boys in one school marketed 160 bushels one year.
8. Raising sugar beets for sugar beet factory.

#### PROJECTS IN HORTICULTURE AND GARDENING

1. Construction and operation of a hotbed,—raising garden plants such as cabbage, tomatoes, cauliflower, etc., or flowering plants such as aster, verbena, salvia, etc.
2. Vegetable gardening and marketing. Well adapted to pupils living in city or village.
3. Raising tomatoes, beans, peas or cucumbers for canning or pickling at home or factory.
4. Growing cabbage for sauerkraut.
5. Starting a strawberry bed. In one school the plants were furnished by the school.
6. Landscaping home or school grounds.
7. Starting the home lawn.
8. Starting a tulip bed at school or at home. Bulbs should be set in the fall.
9. Developing summer flower beds or window boxes.
10. Developing winter blooming flowers in pots or boxes,—slipping, tending, gathering, arranging in bouquets.
11. Building and operating a small greenhouse.
12. Pruning and spraying fruit.
13. Rejuvenating orchard or patch of small fruit.
14. Raising and marketing fruit.

#### PROJECTS WITH ANIMALS

1. Developing a flock of poultry or keeping an egg record over a certain period. Ducks have been raised in some schools. In one school a hen and eggs were furnished by the school to each student for the start, with the requirement that an equal return be

made. In other cases pure bred eggs are furnished by the pupil himself and these are hatched in the school incubator.

2. Raising a litter of pigs or fattening one or more. In one school a pure bred sow was furnished by the school and a good sow returned by the student.

3. Calf raising or fattening: strict account kept, calf weighed regularly and exhibited at the fair.

4. Raising baby beef.

5. Keeping dairy record for 2-5 cows over a certain period, 3-6-9 months and determining yearly profit.

6. Raising pony and fitting him for the fair.

7. Raising, fattening and marketing four lambs.

8. Care and management of bees.

9. Working out life history, economic importance and means of control of insects.

#### PROJECTS ON SOILS, FARM MECHANICS AND FARM MANAGEMENT

1. Fertilizer demonstrations on several plots of soil.

2. Testing acidity and liming of soil.

3. Surveying and mapping to scale home grounds or parks in the city with construction of blue prints.

4. Mapping farm to show crops, acreage, buildings, farmstead, etc.

5. Surveying and mapping ground for tile drainage.

6. Preparing an exhibit of rope and knot tying.

7. Taking apart, setting up and operating a gas engine.

8. Cleaning up and repairing auto engine.

9. Completing a farm management record of the home farm or some other farm: capital invested, operating capital, acreage of crops, live stock kept, receipts, expenses, labor income. Blanks are furnished by United States Department of Agriculture and University of Wisconsin cooperating. Write to college of agriculture, University of Wisconsin or to the United States Department of Agriculture, Extension Division, Farm Management Demonstrations.

f. **The School Project.** This has the following advantages over the home project:

(1) It can be given closer direction and supervision by the teacher.

(2) It attracts the interest and attention of the whole community more quickly and to a greater extent.

(3) It develops an enthusiastic desire in the pupils to want to try out home projects. The well managed school project likewise stimulates the pupils to give good care to their home work.



(4) It stimulates the best practice in the whole community by furnishing a valuable object lesson which attracts the attention of all.

It is interesting as well as significant to notice that there has been scarcely a case where the school project has been developed to the exclusion of the home work. The two have almost invariably grown up together. The school project has therefore come to be considered essential in high school courses.

THE SCHOOL PLOT

The school plot is not required, but is strongly advised wherever adequate supervision and care can be provided for it during the vacation months. If the agricultural teacher is employed for an eleven month's year this supervision is easily supplied and even where this is not the case, it is generally possible to find some one who will see that the plot has proper attention. Unless such provision can be assured it is not wise to attempt the plot work. If care can be provided, the plot makes possible some of the most

<p>Farm Orchard ¼ A.</p>	<p>Potatoes ¼ A.</p>	<p>Pure Bred Corn ¼ A.</p>	
<p>Laboratory Supplies ¼ A.</p>	<p>Demonstration Plot Soils, Alfalfa, etc. ¼ A.</p>	<p>Plots for Small Grains ¼ A.</p>	<p>Farm Garden ¼ A.</p>

Fig. 1. Suggested arrangement of School Plot of 2 Acres.

desirable school project work. Fully half of the eighty high school departments in the state have operated a plot during the last year. The sizes of these plots have ranged from a small garden patch up to fifteen acres. The size has averaged about two acres.

It is very important that the plot should not be made too large at first. A small plot can easily be enlarged if found advisable after a year's successful management, but it may take a good many years to overcome the bad influence of a plot which has been allowed to grow up to weeds. Furthermore, even if a large plot is well cared for, the amount of work required may demand too much of the time and energy of the agricultural teacher to the detriment of other phases of the work which should not be neglected.

## LIST OF SUCCESSFUL SCHOOL PROJECTS

Practically all in this list have been carried out in the high schools of the state and most of them are now in operation. These like the home projects should be selected with special reference to local interests and conditions.

1. Constructing and operating a hotbed,— a very popular and valuable school project.
2. Raising pure bred corn on school plot. A ready sale is always found for good seed corn at fancy prices.
3. Raising cabbage and marketing for sauerkraut.



SCHOOL POULTRY HOUSE BUILT BY AGRICULTURE CLASSES AT GREEN BAY EAST SIDE HIGH SCHOOL.

4. Raising and marketing truck garden products. Especially successful in cities.
5. Raising certified potatoes for seed.
6. Raising potatoes for hill selection demonstration.
7. Raising corn for ear-to-row test.
8. Planting potatoes to demonstrate different methods of cutting and planting. A check or control should be used with the different plots.
9. Demonstrating effect of liming and inoculation on growth of alfalfa with proper controls.
10. Landscape planning and planting on school grounds or on home grounds at request of owner.
11. Developing school flower beds: tulips, geranium, salvia, coleus, aster, pansy, etc. Especially good for the grades. Works well with the hotbed.
12. Preparing flower boxes and other winter blooming flowers for school.



STEER FATTENING PROJECT, NEW RICHMOND HIGH SCHOOL. STEERS BOUGHT BY ANIMAL HUSBANDRY CLASS, EACH BOY CONTRIBUTING \$12.00.

13. Spraying fruit trees. Use control.
14. Operating incubator and raising chicks,—combines well with the home projects.
15. Building poultry coops and houses.
16. Care of dairy cows and marketing products.
17. Erecting model dairy barn.
18. Fattening steers. Two pure bred yearling steers were purchased by the animal husbandry class, each pupil contributing \$12.00. The steers were fattened and sold and a careful account of all items in the project was kept.
19. Fertilizer demonstrations on differently treated plots.
20. Erection of a small greenhouse.

**g. Organization of Projects.** In order that the project may have real educational value, it is necessary that there should be just as careful and as definite a plan for this as for any other school work. Every effort should be made to avoid careless and slip shod work and to see to it that pupils are actually held responsible for faithful performance of the work and for real educational results. Three things are necessary to insure this. Each pupil should be led to follow a definite plan of procedure, careful reports should be required showing progress and completion of the work and regular and frequent supervision should be provided.

#### GENERAL PLAN OF PROCEDURE

1. Preliminary survey of home conditions.
2. Selection of a project.
3. Securing land, seed, or other material.
4. Study of related literature: text, bulletins, selected references.
5. Report by pupil to the teacher showing details of plan.
6. Preparation of land or other material; plowing, harrowing, disking, marking, planting, or any other work.
7. Cultivation and care.
8. Weekly report by the pupil showing work done and progress made.
9. Harvesting, curing, marketing, etc.
10. Final report showing summary of results: nature of project, dates, labor, expense, receipts, profits, etc.
11. Prize essay report,—may be asked for in connection with composition work.

In order that the teacher may advise intelligently with the pupils about their home projects it is highly desirable that he should have definite knowledge of home conditions. If he has been able to visit the homes in the community before the opening of school or early in the year this will prove a great help in this connection; but still further advantage will be gained by having the pupil prepare and hand a preliminary survey report of his own home and

school conditions in connection with the selection of his project. A plan for such a report is suggested in "Report Form, No. 1."

Individual projects should be selected several months before the work must actually be started. Crop projects requiring preparation of land and planting in April or May should be carefully planned not later than the beginning of the second semester and earlier would be better. It is often a decided advantage to select the land early enough so that it may be manured and plowed the preceding fall. In the case of animal projects a good deal of time is also needed for preparation.

The securing of the best seed for crop projects is sometimes a problem. It is very desirable that only pure bred or certified seed should be used. Wisconsin grown seed should always be preferred to any grown outside. Furthermore, seed grown in the immediate locality is much better to use than that grown at a distance. Seeds can, of course, be obtained of the commercial seed houses and it is a very good plan to gather up the catalogs of a number of these, obtained through advertisements in farm papers. The L. L. Olds Seed Company, Madison, makes a speciality of handling Wisconsin grown seeds. At the same time, the agricultural teacher should keep in touch with the agricultural college, with certified growers of the state and with any special state associations such as the State Potato Growers. The official state paper of this association is the Wisconsin Potato Journal which is published quarterly at Madison. The Secretary of the association is Prof. J. G. Milward. The best place to write for general information concerning reliable farm seeds is to the Wisconsin Agricultural Experiment Association, Prof. R. A. Moore, Secretary, Madison. An annual bulletin is published by Prof. Moore giving an official list of certified growers belonging to this association. The Wisconsin Bankers Association recently issued a bulletin on "How to Secure Seed Grain," Bulletin 32, March 1916, by G. B. Mortimer. This can be secured by writing Geo. D. Bartlett, Association Secretary, Pabst Building, Milwaukee. Oftentimes pure bred seeds may be obtained through the county superintendent.

It is highly important that each pupil in taking up a project should make a careful study of the principles and best practice connected with this project. Classroom instruction should furnish this as far as possible, but much more extended study should be made of special bulletins and other references bearing on the project. In this way each pupil should gain as thorough a mastery as possible of all the problems connected with the work. It is through the home project when studied in this way, more than through any other agency that the instruction work of the school will actually take root and function in the home and in the life habits of the pupils. It is the business of the agricultural department to have a good supply of these bulletins and other refer-

ence materials filed in such a way that they are readily available for the use of pupils.

When the time comes for the preparation of the land and the planting of the seed, the teacher should see to it that the pupil attends to this in good season. If the work can be arranged outside of regular school hours, such a plan is desirable, but in some cases it may be necessary for some pupils to be excused from other school work for a day or more to give entire attention to the project. It is expected that principals will see to it that pupils are excused where the success of the project seems to demand it. In such a case, arrangements should be made with other teachers for some plan by which pupils excused shall make up the work which was missed. At the time of harvesting the crop the same necessity for excusing some pupils may occur.

### REPORTS

The reports of pupils on their project work should be given very careful attention. Inspection has indicated that in the past, too little attention has been paid to this phase of the work. Reports have too often been made, if made at all, in a careless and slipshod way both in the matter of good English and also in that of the arrangement and completeness of the material. Except insofar as the teacher can actually visit and inspect the work of each pupil which is most desirable, the report furnishes the best evidence of the attention which each pupil is paying to his project. Even where the teacher does visit each pupil several times during the summer, it is highly important in order that the project may have real educational value, that a careful record shall be kept of all items connected with the work such as time spent, progress made, and costs and receipts of the work. The pupil should be constantly stimulated to formulate and study out problems in connection with the work. The requirement of a definite report is a stimulus in this direction. *Good English and neat, businesslike work should be insisted upon in all these reports.* A simple, definite report is more desirable than one too elaborate which is likely to tend toward formal mechanical work. It is considered very desirable that the pupil should hand in a report as often as once a week. This holds the pupil to a definite and regular study of his project during its whole progress. With only a monthly report the pupil, and especially the young pupil, is too apt to give the matter little thought for considerable periods which is almost certain to lead to neglect in a material way as well as on the side of intelligent study. It is also important that the whole project should be well rounded up and that the result should be organized into good permanent form. Then the teacher should have a concise and accurate record on file showing just what pupils finished their projects in a satisfactory way and giving also the essential results. The following forms are here given with the idea of suggesting plans which are convenient. Nearly all of

them have been in actual use and have grown up in response to the needs of the work. It is expected that they may be modified wherever necessary to meet the local need. In the use of any such forms, strenuous effort should be made to avoid the tendency toward mere formal and mechanical results.

SUGGESTIVE REPORT FORMS

No. 1. Home Project Survey Sheet

(Adapted from New York Bulletin on Agriculture in High School.)

Age..... Name..... Date..... No.....  
 Year..... Name of parent..... Address.....  
 Occupation of parent..... Distance from..... Location of home.....  
 Size of place (acres)..... General Slope..... Amt. under cultivation.....  
 Remarks on place.....  
 Character of soil.....  
 Amt. permanent pasture..... Amt. temporary pasture.....  
 No. fruit trees..... Condition..... Small fruits.....

Crops grown

LAST YEAR					THIS YEAR			
Kinds	Acres	Yield per acre	Value of crop	Cultivation given	Acres	Yield per acre	Value of crop	Cultivation given

Stock				Milk
Number	Breed	Value	Purpose	
Horses				Amt. at present.....qt.
Cows				Disposal.....
Hogs				Value per week \$.....
Hens				
Other stock				

Barns: Number..... Stable room..... Outside dimensions.....  
 Floor space not stable..... Hay room.....cu. ft. Silo capacity.....cu. ft.  
 Houses: Number..... Material..... Sizes..... No. rooms.....  
 Woods: Amt..... Kind..... Description.....  
 Distance to market..... Name of market.....  
 Total capital invested..... Total receipts for year 191.....  
 Total expenses for year 191..... Farm income.....  
 Interest on capital at 5%..... Labor income.....

**No. 2. Report on Selection and Plan of Project**

This report may be attached to and made a part of No. 1.

Age.....Yr. in School.....Name.....Date.....

**Present School Program**

A. M.		P. M.	
Hr.	Study	Hr.	Study

**Home Project**

Name of Project .....

Scope of Project.....  
(Size of plot, crop to be raised, how marketed, etc.)

Materials, how secured.....  
.....  
(Seed, tools, horses, etc.)

Literature studied .....

(Bulletins and other references)

Details of Plan.....  
.....  
(Treatment or testing of seed, method of planting, cultivation, harvesting, marketing, etc.)



No. 3. Weekly Report of Pupil.

Home Projects of the Agricultural Classes.

..... High School  
 Name (Pupil's name).....Class (In school).....  
 Name of Project..... Date.....  
 (Name of Instructor) Mr..... (Place).....

Dear Sir:

During the week beginning.....191.....  
 and ending.....191..... my project was cared for as  
 follows: I have indicated work done, time spent, observations made and an account  
 of expenses and receipts.

Time of preparing soil .....

Time of seeding .....

Kind of seed .....

Time Record

Date.	No. of Hours.	Work done.	By what means.
			Self Man and team Etc.

Account Record

Debit				Credit				
Date.	Items.	Rate.	Quant-ity.	Total	Items.	Rate.	Quant-ity.	Total.
	Labor.....	@ 15c per hr.						
	Labor, man and horse....	@ 25c per hr.						
	Labor, man and teamr....	@ 45c per hr.						
	Labor, man and 4 horses.	@ 60c per hr.						
	Rental of land.....	@ \$1 per A.						
	Manure.....	@ 50c a load						

Stock Fattening Record

Kind and Number of Animals.....  
 Weight: Original..... Weight on (date)..... Increase.....  
 or last weight.

Feed.	Ration items.	Daily Quantity.	Rate.	Daily Cost.	Weekly Cost.

Observations and Problems.

Signature.

No. 4. Dairy Record Sheet

NEW RICHMOND HIGH SCHOOL—DEPARTMENT OF AGRICULTURE—STOCK RECORD

Name of Animal ..... DATE.....

Days	FEED RECORD							MILK RECORD		
	Hay	Corn Stover	Oil Meal	Barley	Corn			Lbs.	10ths	Remarks
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.			
Friday P. M.										
Saturday A. M.										
Saturday P. M.										
Sunday A. M.										
Sunday P. M.										
Monday A. M.										
Monday P. M.										
Tuesday A. M.										
Tuesday P. M.										
Wed'sday A. M.										
Wed'sday P. M.										
Thursday A. M.										
Thursday P. M.										
Friday A. M.										
Total lbs.										Test
Value per lb.										Fat Total
Cost										
Weight										Value per lb.
Loss or Gain										Value of product
Total Cost of Ration										
Profit										

Remarks:

Signed.....



## No. 7. Complete Account Record

a. **Poultry Project.** The following shows a simple set of accounts taken from the New York bulletin on "Agriculture in the High School." The boy who carried out this project started with 3 hens (breed uncertain) 4 anconas, 3 plymouth rocks, 4 white orpingtons, 6 buff orpingtons and 1 buff orpington cock. He set 3 hens with eggs from the buff orpington pen and raised 36 chicks. The other stock he gradually used and sold off until at the end of a year he had all pure bred buff orpington stock. In the meantime he paid himself \$24.30 for labor and made a net gain of \$26.39.

Dr.		Inventory		Cr.	
1914		1913			
Feb. 1	Poultry	\$41 ..	Feb. 1	Poultry	\$26 20
	Equipment	4 ..		Equipment	4 ..
	Feed	1 50		Feed	3 50
				To balance	12 80
		<u>\$46.50</u>			<u>\$46 50</u>

## Cash or Personal

1913		1913		1913	
Mar. 1	4 lb. hen	\$ 70	Feb. 8	Bran (.50 lice powder (.25)	\$ 75
Apr. 5	4 lb. hen	70	Mar. 21	Feed 200 lbs.	3 70
Apr. 12	4 lb. hen	70	Apr. 22	1 pkg. Pan-a-cea	25
Apr. 14	1 wh. orp. hen	1 ..	May 12	Chicken feed, 10 lbs.	25
Apr. 25	1 ancona hen	70	May 12	Bread	12
May 8	4 lb. hen	80	June 3	Chicken feed, 20 lbs.	50
May 15	1 P. R. hen	1 ..	June 3	Meal, 40 lbs.	1 ..
June 5	1 P. R. hen	1 ..	June 3	Feed, 100 lbs.	1 80
July 9	1 B. H. hen	80	June 4	Feed, 100 lbs.	2 00
July 11	1 P. R. hen	1 ..	July 10	Mash, 50 lbs.	70
	etc., etc.		Sept. 30	Feed, 300 lbs.	5 85
Feb. 28	Eggs, 208	4 51		etc., etc.	
Mar. 31	Eggs, 308	6 07			
Apr. 30	Eggs, 291.	4 84			
	etc., etc.				

## Summary

1913		1914			
Feb. 1	Inventory	\$46 50	Feb. 1	Feed, etc.	\$37 92
	Fowls sold	23 05		Labor (self)	24 30
	Eggs sold	53 26		Rental	6 ..
				Interest	2 ..
				Inventory	26 20
				Net gain	26 39
		<u>\$122 81</u>			<u>\$122 81</u>



## AGRICULTURE IN THE HIGH SCHOOL

TEACHER'S RECORD OF REPORTS ON HOME PROJECTS

Name of pupil	Age	Agricultural subject studied during current school year	Title of home project	Scope of home project	Pupil's project income			Family income from pupil's project			Actual hours devoted to project	Number of times teacher visited project
					Net profit	Paid self for labor	Total	Labor, man or horse	Rent, seed etc.	Total		
1	19	Farm crops.....	Home garden.....	1/2 acre.....	\$17 15	\$8 00	\$25 15	\$2 00	\$7 85	\$9 85	40	6
2	19	Farm crops.....	Potato raising.....	3/4 acre.....	77 00	15 20	92 20	2 10	20 70	22 80	76	6
3	19	Poultry.....	Poultry raising.....	1500 chickens.....	616 75	148 76	765 51	.....	42 00	42 00	992	14
4	16	Farm crops.....	Home garden.....	1/2 acre.....	2 43	6 00	8 43	1 00	5 38	6 38	40	8
5	*16	Homemaking biology and crops.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	18	Poultry.....	Beekkeeping.....	12 hives.....	46 99	42 58	89 57	1 00	12 58	13 58	90	4
7	*18	Poultry.....	Turkey raising.....	20 hens, P. R., 1 yr.....	22 79	7 50	30 29	.....	16 57	16 57	374	8
8	*16	Dairying.....	Cheese making.....	3 hens, 1 gobbler, 1 yr.....	76 50	4 50	81 00	.....	6 65	6 65	45	5
9	15	Farm crops.....	Gardening.....	635, 192 lbs. of milk.....	102 50	60 00	162 50	.....	.....	.....	480	4
10	16	Farm crops.....	Corn growing.....	1/2 acre.....	11 90	3 50	15 40	1 00	4 40	5 40	35	8
11	14	Farm crops.....	Potato raising.....	1 acre.....	31 40	8 00	39 40	4 50	17 90	22 40	40	6
12	14	Farm crops.....	Home garden.....	50 X 90 feet.....	-3 78	9 60	11 00	2 50	17 60	20 10	554	4
13	16	Poultry.....	Poultry raising.....	100 chickens, W. L., 1 yr.....	165 36	31 17	196 53	.....	11 40	11 40	207 4	14
14	16	Farm crops.....	Sweet corn for canning factory.....	33 acres.....	31 76	24 20	55 96	.....	18 00	37 50	1614 3	12
15	16	Farm crops.....	Gardening.....	155 X 52 feet.....	11 30	8 35	20 25	1 50	3 07	4 57	597 3	12
16	17	Farm crops.....	Squashes, melons and corn.....	240 X 29 ft.....	15 21	1 65	16 86	3 00	1 70	4 70	11	10
17	15	Farm crops.....	Early potatoes.....	1/2 acre.....	43 18	2 82	46 10	.....	8 00	11 40	191	13
18	14	Poultry.....	Poultry raising.....	90 chickens, 3 mos.....	4 01	7 20	11 21	.....	19 90	19 90	48	13
19	16	Farm crops.....	Field potatoes.....	1 1/2 acres.....	25 80	26 20	52 00	6 50	8 00	14 50	174 3	10

\* Girls.

† Early frost accounts for small profits.

‡ Badly affected by tip burn.

It has been previously stated that every agriculture teacher who is employed for an eleven months year should keep a careful and full account of just how his time is spent each day during the time when school is not in session. This report should be presented to the school board at least once a month and a copy should also be sent to the state superintendent. Perhaps a report once in two weeks might be even better. Where any arrangement is made with the agricultural teacher for the meeting of any part of his expenses in connection with this summer work, a carefully kept expense account should, of course, be presented also to the board. Such an account is desirable in any case. The following is a suggestive blank to be used for this Teacher's Report.

**No. 9. Teacher's Bi-weekly or Monthly Report**

(To the School Board on Summer Work)

Name of School.....  
 Name of Teacher .....Date.....  
 Report of Summer Work from.....191...to.....191...

Date	Work Done	No. of hours	Expenses
July 1			
July 2			
July 3			
July 4			

Etc.

I hereby certify that the above is a correct report of my official work as director of high school agriculture during the above period.

Signature.....

A fuller written report should be made out at the end of the summer in which all data of time and expense should be tabulated and explained with a good summary of results. The following summary is taken from a final report made at Livingston:

**Summary of Summer Work**

Work on plots, garden, lawn, diamond, etc.....	12	days
Collecting and making up samples, etc.....	4	days
Fair exhibit, Platteville.....	2¾	days
Work on farm papers and bulletins for Agri. Library.....	2½	days
On club work .....	14¼	days
Testing work.....	11¼	days
Jersey, Guernsey club picnics, etc.....	3½	days
<b>Total.....</b>	<b>50¼</b>	<b>days</b>







FIELD OF ALFALFA GROWN BY AGRICULTURAL BOYS AT MONDOVI ON A LOCAL FARM. THE OWNER CO-OPERATING. A VERY SUCCESSFUL PROJECT.



SCHOOL PLOT AT GREEN BAY, EAST SIDE. ABOUT THREE ACRES. 44 BOYS WERE GIVEN GARDENS, EACH 17 FEET BY 46½ FEET.

It is in this way that the most effective kind of extension work may be started. Three or four such visits ought to be made during the summer to each boy who is carrying on the home project work.

The matter of expenses on these trips is one of some importance. It is hoped that as school boards see the value of this work that they will be ready to supply compensation to meet such expense. Some are already doing this. In other cases many teachers are finding ways of meeting the problem. Some are providing themselves with bicycles or motorcycles for transportation and in most cases parents are very glad to furnish meals during the stay of the teacher. Often parents are also glad to furnish transportation to a limited extent. If no other means of transportation can be arranged, walking is always a last resort and withal a very effective method.

In case the agricultural teacher is not employed for eleven months, some other supervision ought to be provided for the summer work. In a number of cases some local person has been found who was ready to do this at very small expense. An experienced older student may sometimes be secured. If no special supervision is supplied during the summer the regular teacher should give the fullest possible attention to the home projects as late as possible before the end of the year and again as early as possible in the fall. No better thing could be done for the success of this course, as well as for the benefit of the whole school, than for the agricultural teacher to return several days early and devote the time to inspecting the home projects and visiting in other farm homes of the community. Frequently young people not in school may become interested through such visits and be led to a decision to enter high school.

There have been a number of cases in the state where the agricultural teacher in his enthusiasm to develop practical work that would interest the community, has found a way to stay during the summer and give supervision to both the school and home projects without compensation. It is interesting and significant to notice that in nearly all such cases an interest has been aroused which has led to the employment of the agriculture teacher for eleven months the following year. However, important as the summer supervision is, it should be noted that some fairly successful project work may be completed, by a careful plan of reports and by a well planned school exhibit in the fall. If the work is started in this way a community interest is usually aroused which leads to some plan of supervision for the following year.

**h. Credit for Home Projects.** If the home project work is to be considered as an essential part of the agriculture work as has been urged, there should be some plan by which credit is definitely given for it. Effort has been made by some to work out an elaborate system of credits by which a certain proportionate amount of credit shall be given based on the time devoted to the project work. Results of one such effort have been published by the United States Department of Agriculture as Bulletin No. 385, on School Credit for

Home Practice in Agriculture.<sup>1</sup> Many good suggestions are contained in this bulletin but much of it is probably too elaborate for practical use in most cases. Moreover, a mechanically fixed system of credits is not considered desirable in the high school work. The motive of working simply for marks is already too apparent in its bad effects upon the schools. In this work especially the practical vocational motive should be emphasized above everything else. However, students should be made to feel that the project work is an essential part of the work and they should be held definitely responsible for its completion. There should therefore be some definite plan of crediting this work. It is thought wise here to leave to individual teachers the matter of what proportionate amount of credit should be given to this in relation to other phases of the work. It cannot fairly be put wholly on a time basis though this should perhaps be considered. It is even questioned whether it is wise to give any percentage mark to this part of the work by itself, but rather to count it as part of the whole plan of the instruction work. The percentage mark is often only a temptation to the pupil to falsify reports or to do dishonest work. The joy of success in the project itself and in the mastery of the problems involved is the real motive which should be aroused by every possible means.

#### i. Suggestions for Special Projects

(1) **Projects to begin with.** Three of the projects in the above list are regarded as most feasible for schools just beginning this work. First, garden work is best adapted to seventh and eighth grades and for first year in the high school. It may also do well for second year in high school. It is further specially adapted to pupils living in cities or villages. Hotbed work connects very nicely with the garden work. Five or six vegetables should be selected for all in the garden group to raise. Beets, carrots, cabbages, potatoes, onions, and tomatoes make a good list. In addition, each pupil may be allowed to select several more which appeal especially to his interest. A uniform sized plot is desirable, but this may vary for different grades. For first year high school pupils, a good size is 30x50 feet.

A second project is raising pure bred corn or standard potatoes on a given area. The "Acre Corn Contest" is being carried on by many schools, but the half acre may be used. A quarter acre is good for potatoes. The Iowa State College of Agriculture publishes a fine circular on the "Corn Acre Project."<sup>1</sup> Potato and Canning Club work is described in a circular of the University of Maine.<sup>2</sup>

A third project is adapted to girls. It consists in raising tomato plants, producing fruit and canning at least a part of the product. Green tomato pickles may also be made. Both the fruit and the

<sup>1</sup> School Credit for Home Practice in Agriculture, by F. E. Heald, Bulletin No. 385, States Relation Service, U. S. Dept. of Agriculture, Washington, D. C.

<sup>2</sup> Iowa Boys' and Girls' Clubs, Course 1—Acre Corn Contest. Circ. 19, 1912. Iowa State College of Agriculture, Extension Department, Ames, Iowa.

<sup>3</sup> Agricultural Contests for Boys and Girls. Circ. 2, Nov. 1913. Extension Department, College of Agriculture, University of Maine, Orono, Maine.

canned product may be exhibited. The tomato project is not very well adapted to the northern part of the state. Beans or peas may be substituted for the tomatoes.

**(2) Poultry Project.** Poultry work has been especially successful as a home project in many schools. This has been particularly true for boys living in villages or cities. At Green Bay nearly a hundred boys were carrying on this project at one time. After a breed had been selected by each boy, pure bred eggs were purchased and hatched in the school incubator, each boy paying a small sum for operating. When chicks were hatched they were taken home and each boy was expected to make or purchase a brooder and later necessary coops. Before winter a suitable house was constructed and the hens were brought to producing as soon as possible. Careful records were kept of all costs and expenses for a year. Fowls were exhibited at the midwinter poultry show held at the school.

Here is the summary of one boy's account for a year's work.

#### Expenses

Cost of chickens to start with.....	\$4.65
Cost of keeping chickens 1 year.....	26.00
Total cost .....	<u>\$30.65</u>

#### Receipts

No. eggs produced by 20 hens from Dec. 1, 1914, to Dec. 1, 1915.....	2,147
No. eggs sold .....	827
Eggs sold .....	\$17.56
Eggs used .....	27.50
33 cockerels at 60c.....	19.80
Hens sold .....	9.25
Total receipts .....	<u>\$74.11</u>
Cost .....	30.65
Net profit .....	<u>\$43.46</u>

**(3) Steer Project.** A steer fattening project aroused unusual interest at New Richmond. The boys of the Animal Husbandry class each contributed \$12.00 for the purchase of two yearling steers, one pure bred and the other seven-eighths shorthorn. A barn and small pasture were rented nearby the school house. Rations were figured out by the boys as a part of the class work and the work of fattening was begun, each boy being held responsible for feeding the animals for at least one week. The ration used at first was changed once or twice due to individual differences discovered in the animals. The steers were fed between October 2nd and December 17th when they were sold to a local butcher. During the fattening the animals were taken to the city scales and weighed each week. This part of the program aroused unusual community interest. In fact, such a general local interest had been developed by the time the project ended that the business men including a number of farmers gave the boys a banquet at the leading hotel. The event was made an important affair at which after dinner talks were made by leading local men

and by a number of outside visitors. The boys themselves were represented in these talks. The interest aroused in this whole project was so great that the following year a stock company was organized in the school for the purchase of steers. Stock was sold at \$1.00 per share. The steers this year were sold in St. Paul and the boys accompanied by the agricultural director made a trip to the stockyards to market the steers and see them slaughtered.

**(4) Dairy Project.** Dairy cows have been kept and their products marketed in at least three of the high school departments of the state. Small dairy barns have been constructed at Green Bay and Viroqua.

**(5) Farm Management Project.** A very successful farm management project was carried out at Omro during the year 1914-15. This was carried out through a cooperative arrangement with the College of Agriculture of the University of Wisconsin, and the U. S. Department of Agriculture. In this study 79 ordinary farms in the vicinity of Omro were investigated as to capital invested, equipment, crops raised, stock kept, total expenses and receipts. From these were computed farm income, interest on capital and labor income. Blanks for this work were secured from the U. S. Department of Agriculture and the boys in the farm management class assisted and directed by the agriculture teacher gathered the data and computed results. Fuller information about the plan and results may be obtained by writing the College of Agriculture, University of Wisconsin, Farm Management Department.

#### LITERATURE ON HOME PROJECTS

- Home projects in secondary agriculture. U. S. Department of Agriculture, Department Bulletin No. 346, States Relation Service.
- Agricultural projects for elementary schools—The Commonwealth of Massachusetts, Bulletin of the Board of Education, 1911 No. 1, whole No. 1, 2d Edition Nov. 11, 1913 Boston, Mass.
- The Massachusetts home project plan of vocational agricultural education by R. W. Stimson, U. S. Bureau of Education, Bulletin No. 8, 1914. Whole No. 579.
- Suggestions for school and home projects in agriculture by K. L. Hatch and W. T. Stewart, Bulletin of the University of Wisconsin, No. 757, High School Series No. 16.
- Home projects for school agriculture by A. W. Nolan, Agricultural College Extension, University of Illinois, Urbana, Ill., March, 1913.
- Correlating agriculture with the public school subjects in the northern states by C. H. Lane, U. S. Department of Agriculture, Bulletin No. 281.
- Supervision of home project work. Bulletin No. 22, Department of Public Instruction, Educational Publications, Vocational Series, No. 14, Indianapolis, Indiana.
- Boys and girls club work. Annual Report for 1914. Commonwealth of Massachusetts, State Board of Agriculture, Boston, Mass.
- School credit for home practice in agriculture by F. E. Heald, Bulletin No. 385, States Relation Service, U. S. Department of Agriculture. Reprinted.

(6) **Contests and Exhibits.** Every school giving the agriculture course should plan an annual fall exhibit or Harvest Festival. Many schools are holding also a mid-winter poultry exhibit. These are of the greatest value in emphasizing results, increasing interest and developing a strong motive for the best effort. A school exhibit should be planned in the fall when the products of the projects are sufficiently matured. This school exhibit is of special importance as a means of bringing the people of the community to the school where they may see and understand more fully the work of the agriculture course.

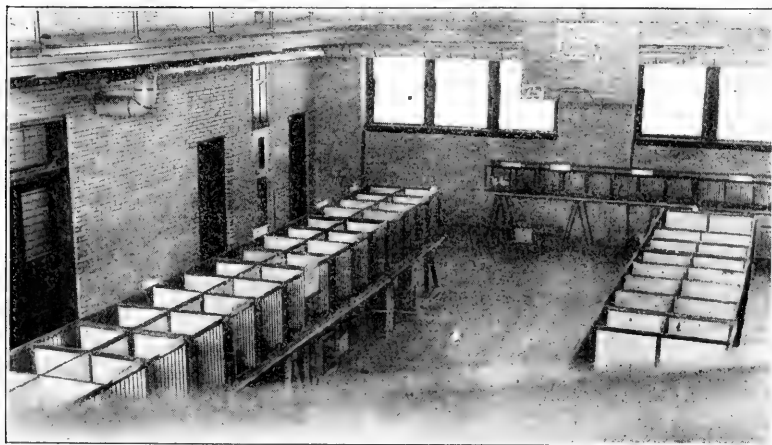
It is especially desirable that the exhibit should be held at the school if possible; at least, it should be under the direction of the school and should be made an important feature of the agriculture course. One of the best plans for the school exhibit is to arrange a general "Harvest Festival" in which the agricultural side is made a prominent feature and in which any other work of the school may be exhibited also. The domestic science department, in schools where this exists, can furnish most excellent help in such a festival. The social side may well be given some prominence. This links up very nicely with the domestic science side. Invitations should be planned and sent out by members of the agriculture classes to patrons of the school and other members of the community. Following the Harvest Festival at school, the best of the school exhibit may be made the basis of another exhibit at the County Fair or at some other important agricultural gathering. Frequently a school exhibit may be made in connection with a local poultry show or pupils may be urged to make individual entries. Efforts should be made to cooperate as far as possible with other agricultural agencies of the locality. County superintendents in many counties are planning such work throughout the county. The bankers in many localities have shown special interest in giving help in such contests. The plan may be made easily broad enough to include exhibits open to the farmers as well as the pupils.

In connection with the exhibits, contests should be planned as an important feature. Suitable prizes should be offered. Conditions of the contests and a full plan for the prizes should be carefully worked out and adopted when the projects are arranged. Money prizes may be offered, but such prizes as good books on agricultural subjects, agricultural journals, useful farm articles donated by the business men of the town, pure bred seed or young animals, a trip to the County or State Fair, or a trip to the Boy's Short Course at Madison, are much more desirable. Business men in towns where agricultural courses are given have shown unusual interest in giving help financial and otherwise, in connection with these school exhibits. Dealers are usually ready to donate useful farm articles. Agricultural papers have been exceedingly generous in donating subscriptions although they could not be expected to do this very generally.

Stock judging contest work is very valuable and has become very



INCUBATOR ROOM, GREEN BAY WEST SIDE HIGH SCHOOL.



WINTER POULTRY EXHIBIT, GREEN BAY WEST SIDE HIGH SCHOOL.  
500 BIRDS ENTERED.

popular about the state. Much of this may be organized among the pupils of the same school, but an occasional contest among several schools of a district adds to the interest and stimulates the best work. Last year a state contest was organized and held at the Agricultural College, Madison. Detailed plans for conducting stock judging contests and for calculating rankings and percentages is given under the treatment of "Farm Animals" in this manual.

Some State Fairs have been giving large attention during the last few years to young people's agricultural exhibits and contests. At the 1916 Wisconsin State Fair a large exhibit space was devoted to this work and a series of contests was carried out for both boys and girls. The classes of exhibits included garden products, fruit, corn, potatoes, alfalfa, grains, poultry, calf raising, pig raising and baby beef for the boys and needlework, canning and cooking products for the girls. Special contests were held in stock judging, corn judging, apple judging and identification, canning, sewing and baking. Special prizes were given for school exhibits and booths. Full information concerning premiums, rules and regulations of this department may be obtained by writing to the State Department of Agriculture, Capitol Building, Madison.

The exhibit and contest work should be looked upon not as the main feature of an agricultural course, but rather as a very valuable objective means of rounding up interesting results of the more fundamental daily work. Such exhibits help greatly in stimulating a strong motive on the part of the pupils and in arousing their best efforts. At the same time, they are the best means of arousing interest on the part of the community and securing its best support. It is difficult to get patrons to visit the schools in connection with the ordinary daily work, whereas they will come eagerly in connection with some special exhibit at which time it may be possible to acquaint them with the whole work and often gain loyal support where only unintelligent criticism has existed. For these reasons exhibits and contests are of greatest importance during the early development of an agricultural course though they continue to have great value. *The "Harvest Festival" is therefore strongly recommended as an annual event in all schools giving this course.*

In all such exhibits it should be emphasized in every possible way that the work represents the results of the course in school. For this reason the exhibit ought to be held at the school wherever adequate space can be secured. If necessary to hold it elsewhere, all the advertising and labeling of exhibits should make the name of the school a prominent feature and should show that the whole thing is the product of school work and especially of the agricultural course. This does not mean that exhibits by farmers and by others not in school may not be made a part of a school exhibit, but in such cases outside exhibitors should be placed in a separate class and their exhibits should be so labeled.



The following bulletins and circulars give helpful material in connection with exhibits and contests:

**From U. S. Department of Agriculture**

- Farmer's Bulletin, No. 385, Boys' & Girls' Agricultural Clubs.
- Farmer's Bulletin, No. 562, Organization of Boys' and Girls' Poultry Clubs.
- Circular 803, Bureau of Plant Industry on Organization and Instruction in Boys' Corn-Club Work.

**From Extension Division, Agricultural College, University of Minn.**

- Leaflets on Gardening and Canning Clubs.
- A Potato Growing Contest
- Boys' and Girls' Club Work
- Pig Clubs for Minnesota
- Industrial Contests for Minnesota Boys and Girls, 1914-15
- Report of Boys' and Girls' Club Work for 1914.

**From Agricultural Experiment Station, Purdue University, La-Fayette, Indiana**

- Circular No. 29, Live stock Judging for Beginners (Revised edition)
- Circular No. 19, Industrial Contests for Boys and Girls

Write to the State Board of Agriculture for the Complete Premium List of the Wisconsin State Fair.

The following tables and blanks are suggestive for the organization of corn or potato contests and may be adapted for use in other cases.

**Record Blank on Selection of Plot**

Member's Name -----

1. Nature of Project -----
2. Date plot was selected -----
3. Kind of soil: (Clay, black loam, sandy loam, etc.) -----
4. Crop raised or other use of land last year -----
5. Size of plot: (Use rods or feet, exact measurement) -----
6. Location of plot: (What part of farm, field, etc.) -----
7. Width of border around plot to be planted to same kind of corn -----
8. Amount of rent to be paid for use of plot. \$-----
9. If plot is owned, amount of rental value. \$-----
10. Difficulties, if any, in securing suitable plot -----

NOTE: The idea of a border in point "6", is to avoid injury at the edges of the plot.

## High School Acre of Corn Contest

## Contest Rules

No. 1. Each boy or girl who enters the contest must grow one acre (160 square rods) of Wisconsin No. 12 (Golden Glow) or Wisconsin No. 7 (Silver King) pure bred corn.

No. 2. The acre must be measured and approved by the committee of the ..... high school.

No. 3. Each contestant must furnish his own pure bred seed corn.

No. 4. The contestant must exhibit at the School corn show, ten of his ears of corn, raised upon this acre.

No. 5. The contestant must exhibit at the school corn show, one bushel (80 lbs.) of corn, raised upon this acre.

No. 6. A set of accounts showing net profit and a statement of his yield in bushels and pounds must be exhibited at the school corn show.

No. 7. The accounts and yield must be certified to by two neighbors who are not relatives. The persons to be selected by the person entering the contest at the time of the entry, subject to the approval of the committee.

No. 8. The committee shall consist of the board of education, the city superintendent and the agricultural instructor of the ----- high school.

No. 9. The account shall be figured as follows: Rental of land \$5.00, seed corn \$2.00 per bushel; labor, man 15c per hour; man and horse 25c per hour; man and team 40c per hour; use of machinery \$2.00; manure 50c per load; husking corn 5c per bushel, and other items of expense at cost.

No. 10. All contestants must agree to enter all four departments. No premium to be paid unless all four entries are made.

No. 11. The ten ears entered remain the property of the exhibitor. The bushel, however, becomes the property of the association to help pay the cost of the exhibit.

No. 12. Each contestant must send every week a report to the agricultural instructor upon blanks furnished by him.

No. 13. The judge of the ..... corn show shall be selected by the committee.

No. 14. All other questions that may arise shall be settled by the committee.

No. 15. Information relative to the growing of corn may be obtained from any reliable source. The instructor of agriculture of the ..... high school will be glad to assist you at any time.

No. 16. The following points shall determine the successful contestants:

Yield .....	40 points
Quality as shown by 10 best ears and one bushel of ears .....	30 points
Cost per bushel to grow.....	20 points
Financial record .....	10 points

No. 17. **First Prize**—A scholarship and expenses to Boys' Short Course at Madison.

**Second Prize**—A free trip with all expenses paid for one day's visit to the State Fair at Milwaukee.

**Third Prize**—A setting of eggs from pure bred stock.

**Fourth Prize**—A bushel of pure seed potatoes.

No. 18. No prizes shall be awarded unless the contestant complies with all the above conditions.

No. 19. This contract must be signed and returned to the instructor of agriculture of the .....high school on or before May 20, 1914.

**Contract**

I hereby signify my desire to enter the acre corn contest of the high school and do hereby agree to fulfill all the conditions set forth in the above rules.

Signed .....  
 .....  
 Parent or guardian's signature  
 .....  
 Agricultural Instructor of the High  
 School

Date....., 191..  
 .....  
 Names of persons, not relatives, who will  
 certify to accounts and yield.

**Report of Progress of the Work**

- Date of Planting—
  - Kind of pure bred corn used for seed—
  - Clay, sand or black loam soil—
  - General condition of corn on July 4th.—
  - Number hours labor put in with team up to July 4th.—
  - Number hours labor put in with one horse up to July 4th.—
  - Number hours labor put in for single man up to July 4th.—
  - Number loads manure used—
  - Kind of cultivator used—
  - Was it dragged while coming up through the ground?
  - How many times has it been cultivated before July 4th?
  - Any signs of cut-worms or white-grub?
  - Did you plow up sod ground for your corn?
  - What per cent did you have to replant?
  - Have you used deep or shallow cultivation?
  - Was your corn planted deep or shallow?
  - Student sign here.....
- Report should be sent in soon as possible. Continue to keep exact records of everything concerning your own corn from now on.

Circular 803, Bureau of Plant Industry on "Organization and Instruction in Boys' Corn Club Work," previously referred to gives further valuable suggestions along this line.

**6. Manual Training Work.** It is expected that some manual training work shall be organized in connection with the agriculture course, although as previously stated, schools offering the special manual training course should not expect the agriculture pupils to take the complete course. It is strongly urged that special classes be organized for agriculture students so that the work may be especially adapted to their needs. It will be noticed in the outline of courses in this manual that construction work and mechanical drawing are urged for two periods a week throughout the course. It is expected that even the smaller high schools can arrange to give at least three hours a week to this work. The forge work suggested for the second year is considered especially valuable. Every school giving the agricultural course is urged to provide at least one forge. The pupils at Mondovi have erected a cement block shop in which were installed several benches and forges with complete sets of tools. The shop was 16'x24'x8' inside measurement. Farm carpentry, forge work and cement work were all carried on in this shop. Space in the basement of the school building may often be used for this purpose. Outlines and further suggestions for this work may be found under "Treatment of Subjects."

**7. Community or Extension Work.** It is urged that community or extension work should be undertaken by the agriculture teacher with a good deal of caution, and only after a careful study of conditions in the community and some acquaintance with the farmers. It is urged that the interest of the farmers should be gained first through practical results secured in connection with the course in school, especially through the Harvest Festival and the results of the practical project work. It is far better for the agriculture teacher to visit the homes of the boys in the course and assume the attitude at first of a learner who wants help and coöperation, rather than as an expert come out to show them how to do things or to correct poor practices. Later, after sympathy and coöperation have been gained, and some enthusiasm has been aroused in connection with the course in school, then it may become possible for the teacher to become a leader in bettering agricultural conditions in the whole community. This is especially possible where the teacher is employed during the summer months. Opportunities in this direction should be improved as far as the time and energy of the agricultural teacher will permit. Notwithstanding the difficulties, a number of schools have carried on some excellent work in this line. Among the lines which have proved most successful are the following: arranging for programs for farmers' meetings held in district school buildings for the presentation and discussion of local problems, distributing lime at cost among farmers of the region surrounding the school, demonstrations in starting a field of alfalfa on some farmer's field, cow testing work among herds of the community, arranging "farmers' week" programs through the Extension Service of the Agricultural College, orchard demonstrations, pure seed distribution, testing seed corn for surrounding farmers,

carrying on farm management demonstrations among the farmers of the locality, helping country school teachers in organizing practical agricultural work. Much of this work has been developed in connection with the school and home projects which have first aroused community interest.

One bulletin<sup>1</sup> on "Community or Local Extension Work by the High School Agricultural Department" gives the following classification of such work: "(1) Work with farmers, as organizing or working in farmers' clubs, an annual 'farmers' week' of agricultural lectures, field and orchard demonstrations, coöperative experiments on farms, good seed distribution, seed and milk testing, preparing plans for buildings, and selecting and purchasing improved live stock, etc.; (2) Work with farm women, as afternoon or evening meetings, short courses, and home garden and poultry experiments; (3) Work with young people, as short courses in agriculture and home economics, agricultural contests, and literary societies; (4) Work with rural school teachers, as meetings for agricultural instruction, assisting in conducting school fairs and rallies, and outline lessons in agriculture and home economics; and (5) work with rural school children, as boys' and girls' agriculture or domestic science clubs, schoolhouse "fairs" or exhibits of work, rural improvement and athletic field days."

The agricultural director in a high school in New York reports the following: "The work that can be carried on in any community would be milk testing, encouraging and showing the farmers that certain cows are 'boarders', tuberculin testing, especially where milk is sold by the quart, feeding experiments, growing of clover, alfalfa, or leguminous crops, better corn, drainage, liming soils, intelligent buying and use of commercial fertilizers, breeding of animals, spraying of fruits, treating grains for smut, and management of farms. Of course, the above cannot all be accomplished in one year, as the farmer must be shown before he will change. I find that the farmers have had too much advice from the 'platform' and are demanding us to give facts and figures."

The following piece of extension work was carried on last year at New Richmond, Wis. Three Holstein cows owned by separate farmers were loaned to the animal husbandry class for a butter fat contest. One of the boys was appointed herdsman. Rations were worked out by the class and were changed from time to time as results seemed to demand. Each cow was tested as to amount of milk, per cent of butter fat and total butter fat. At the end of the test a banquet was held at a local hotel attended by business men and farmers including the owners of the cows. Results were announced and discussed and the owner of the winning cow was presented with a trophy cup furnished by the Country Life Club which is made up of the boys in the agricultural course. It is interesting to note that under the boys'

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<sup>1</sup> Circular No. 109 Community or Local Extension Work by the High School Agricultural Department, by W. G. Hummel, University of California, College of Agriculture, Berkeley.

care the cows were made to produce more than they had ever done under the care of their owners. The following table shows the results:

Name of Cow.	Testing period days.	Lbs. milk daily.	Total lbs. milk.	Average test.	Lbs. butter fat.
1. Phebe .....	177	36.1	6,401	3.67	235.49
2. Lillie .....	217	33.5	7,349	2.90	219.62
3. Bess .....	103	34.9	3,601	3.65	131.82

Under the present demands made upon high school agricultural teachers in Wisconsin it is certain that they are limited in the amount of extension work that is possible. It is also certain that wherever good practical work is developed in connection with the school and home projects, a large amount of good extension work will grow up. If teachers are employed for the summer and especially if they are retained for three years or more in the same place, it will make possible a large amount of extension work which will be able to improve decidedly the spirit and practice of the whole community. The suggestions given above indicate some of the lines which have been and which therefore can be accomplished, and such work should be developed as far as possible consistently with the maintaining of thoroughly strong work in the school.

## VI.—EQUIPMENT.

**1. Special Room.** Schools expecting to receive special state aid for the agriculture course, must provide a good sized special room, in which suitable apparatus and a good supply of illustrative material may be gathered together and where suitable arrangements may be made for the growing of plants, and for the laboratory side of the work. Such a room should be provided with tables and chairs similar to those required for botany work, and wherever possible, gas, running water and a convenient sink should be supplied. A room about 20x28 feet is recommended for the average school. A combination laboratory and recitation room is very satisfactory. On the sides of the room there should be liberal case room with drawers and shelves for supplies. Laboratory tables may be placed in a portion of the room and if needed more may be placed along the sides of the room. Movable chairs may be used about the tables or placed together in one portion of the room for recitation work. A permanent teacher's desk should be set in the front of the room and if possible supplied with water and gas. Perhaps a better plan for the recitation seats is to have

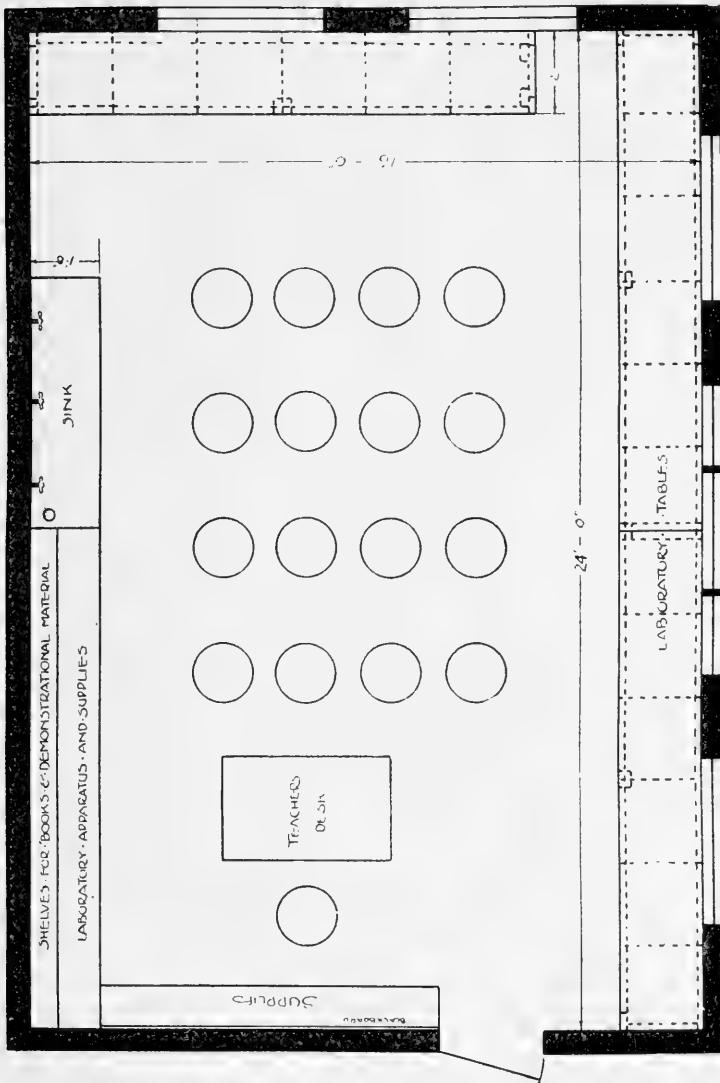


FIGURE 2.—PLAN OF COMBINATION LABORATORY AND RECITATION ROOM.  
(From New York State bulletin)

them fixed permanently at the front end of the room and then supply other seats for use about the tables. Where all the space in the center of the room is needed for recitation seats, all the laboratory tables may be placed about the sides of the room, although this has the objectionable feature of requiring pupils to face the light while at work. It has the objection also of limiting too much the amount of available blackboard. In any case blackboard must be provided in front. The accompanying sketch (see figure 2) shows a plan taken from the New York state bulletin. Plate 8 shows the agriculture room at Neenah, Wisconsin, where work tables are placed in the main part of the room back of the recitation seats. This room has another feature which is most desirable wherever it can be arranged; viz., a window garden in the rear, which is most useful for growing plant material and for many experiments. The biology work can be carried on very conveniently with the agriculture, but the physics laboratory is not a satisfactory room for agriculture.

**2. Tables and Cases.** There should be sufficient table room so that the maximum number of pupils in any of the classes may be seated for work at the same time. A simple, solid table with one tier of drawers and square legs is most desirable. Such tables are furnished by many of the scientific companies such as Central Scientific Company and the Welsch Scientific Company of Chicago and the Kewaunee Manufacturing Company, Kewaunee, Wisconsin. However, such equipment can often be secured at less expense through some local firm.

A black finish is exceedingly desirable for table tops. Some firms supplying tables now furnish such tops, but the following directions will enable any local painter or firm to put on a black finish which is very generally used in science laboratories.

#### A Black Finish for Table Tops

(Reprinted from the Journal of Applied Microscopy, Vol. 1, No. 8)

The following solutions are required:

##### I.

125 grams of copper sulphate,  
125 grams of potassium chlorate,  
1,000 grams of water,  
Boil until salts are dissolved.

##### II.

150 grams of anilin hydrochlorate,  
1,000 grams of water,  
Or, if more readily procurable,  
120 grams of anilin oil,  
160 grams of hydrochloric acid,  
1,000 grams of water.





NEENAH LABORATORY.

By means of a brush apply two coats of solution No. 1 while hot, the second coat as soon as the first is dry. Then apply two coats of solution No. II and allow the wood to thoroughly dry. A coat of raw linseed oil is next applied. It is best to use a cloth instead of a brush so as to get only a very thin coat of the oil. The desired amount of polish is now given the wood by rubbing in the oil. In the treatment with the oil the deep black color is partially brought out, although this does not uniformly appear until the table has been thoroughly washed with hot soapsuds. This takes out the superfluous chemicals.

The finish thus secured is an ebony black which is permanent and very highly resistant to the action of chemicals, such as acids and alkalies, even concentrated sulphuric acid having little or no effect if quickly washed off.

There should be from 12 to 20 feet of case room supplied. Cases should have cupboards or drawers below and shelves above. It is a good plan to have cupboards or drawers about 20 inches deep and the shelves above 12-14 inches deep, leaving a ledge 6-8 inches wide about three feet from the floor. Wooden doors should be used below but above it is best to have glass doors, as this helps greatly in locating material.

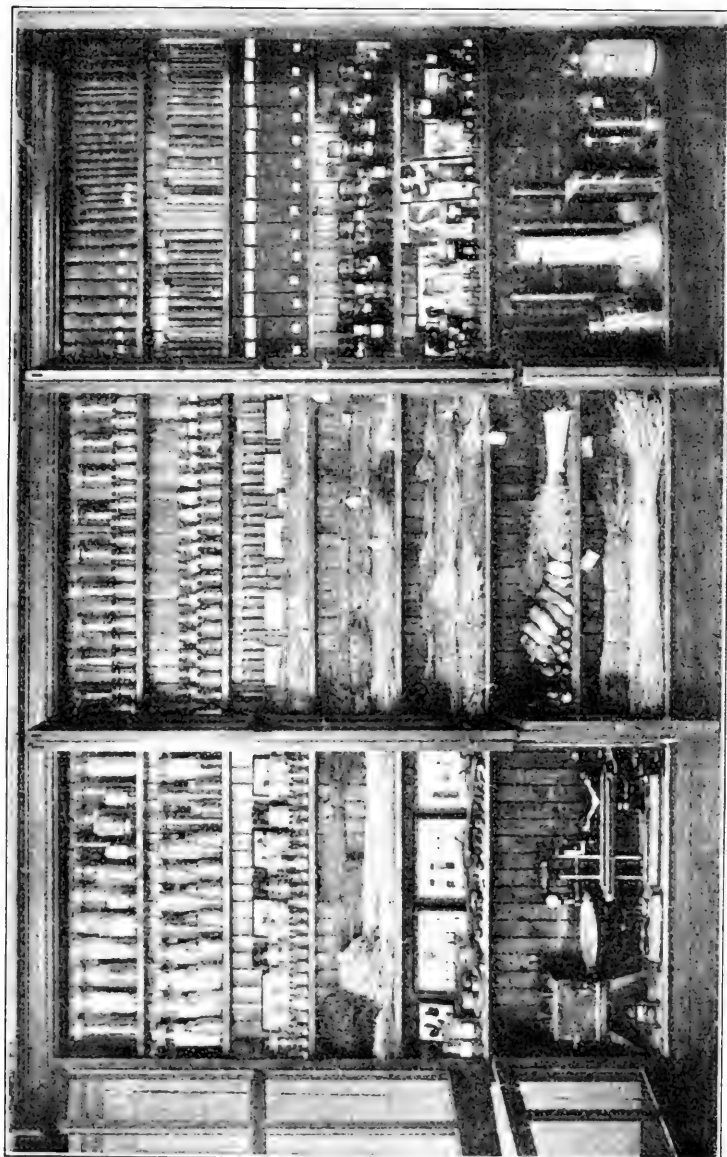
The accompanying sketches taken from the New York state bulletin will show details regarding cases and tables more clearly. (See figures 2 and 3.) Plate 9 taken from the same bulletin gives a front view of a case showing materials arranged on the shelves according to the following list.

Case 1. (At left)

- Shelf A. (Top) Fertilizers,—collected locally, from dealers, or elsewhere
- Shelf B. Poultry feeds,—collected locally
- Shelf C. Insect mounts showing life histories
- Shelf D. Crops in sheaf,—collected locally
- Shelf E. Insect mounts,—life histories

Case 2.

- Shelf A. Threshed grains,—collected locally  
Threshed grains,—standard market grades purchased from University of Nebraska, department of instructional agronomy
- Shelf B. Shelled corn,—standard types  
Corn products  
Grains,—standard grades
- Shelf C. Grass seeds,—standard  
Grass seeds,—collected from local market  
Grasses in head,—standard  
Grasses in head,—collected locally
- Shelves D & E. Wheat, oats and barley in head,—standard and local collections



LABORATORY CASES, FOR LIST OF CONTENTS SEE PAGES 82 AND 85  
(From New York State bulletin)

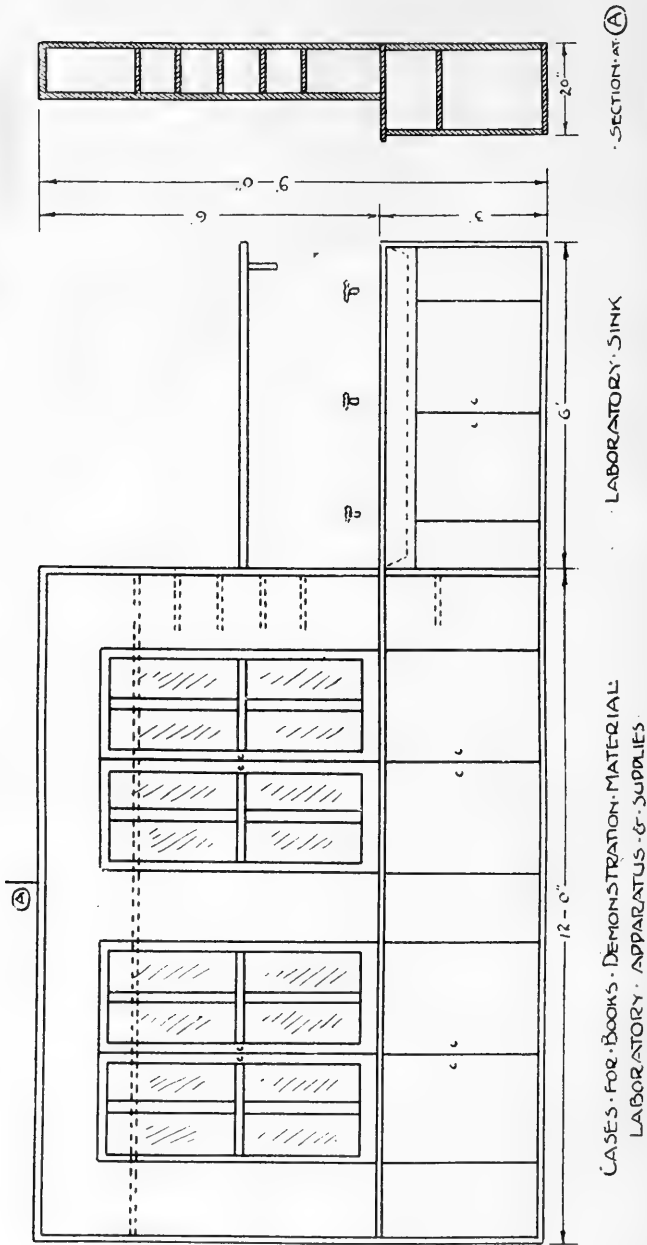


FIGURE 3.—ELEVATIONS OF CASES FOR BOOKS, DEMONSTRATION MATERIAL, APPARATUS AND SUPPLIES SHOWN IN THE PLAN ON THE PRECEDING PAGE.

(From New York State bulletin)

Shelf F. Corn in ear,—standard types  
Grain in sheaf,—collected locally

Case 3.

Shelves A & B. Agricultural books

Shelf C. Bulletins filed in library cases

Shelves D & E. Plant Pathology specimens and laboratory supply,—collected locally and secured from department of plant pathology, New York State College of Agriculture

Shelf F. Apparatus.

A very convenient special case has been devised in one school for holding specimens of corn in the ear to be used for judging, demonstrations etc. This case is 38" x 64" and 17" deep. Panels are cut out at the sides and back and covered with wire netting to give good ventilation and keep out mice. At the front is a tier of drawers, each about 4 inches deep for holding the ears. A card label is placed on the center of the front of each drawer for showing what the drawer contains.

All cases should be made of some substantial wood preferably hard, and should be neatly finished with stain or varnish. Frequently pupils in the agriculture course may construct good cases, but care should be exercised not to use so much time as to interfere with the regular work. Good workmanship should be insisted upon.

**3. Apparatus.** Apparatus need not be elaborate, but there is a definite, special equipment needed for efficient agriculture work in the high school. Much of the equipment for the general sciences may be used, but this is not sufficient. A careful estimate should be made out during the summer by the agriculture teacher for the supplies needed the following year based on a careful survey of the work to be given. Boards of education expecting state aid must expect to supply sufficient funds for necessary equipment. Much local material may be collected by teacher and pupils and some apparatus may profitably be constructed as a part of the work, but there is a limit to the time which can be given to such construction work and furthermore, materials are necessary for mounting collections and constructing homemade materials. Charts, insect mounts, mounted pictures of farm animals, etc., are examples of such material. See list.

The following list of apparatus and illustrative material represents about what each school should have. Some modifications may be made according to local conditions, but these need not affect the list to any great extent. Prices of particular articles are not given since these vary somewhat and are easily obtainable from the catalog of any reliable firm supplying such goods. The entire list of needed apparatus will cost approximately \$200.00, based upon a class of ten pupils for each year's work. Much valuable

illustrative material may be obtained by watching free advertisements in agricultural papers, magazines, etc. One school has followed very successfully the plan of asking pupils to report such advertisements. The pupil reporting a particular advertisement is asked to send for the material, which is mounted or put into most convenient shape for use, when received. In some cases, a single instrument like the Babcock tester, is sufficient for the whole class. In other cases, however, a larger number of pieces should be provided according to the needs of the class.

### REQUIRED LIST OF APPARATUS AND SUPPLIES

#### Farm Crops

Blotting paper sheets	Specialty Mfg.Co., 1045 Raymond Ave., St. Paul. See also other supply companies
Flower pots, about 3" and 5"	
Garden tools, if plot is operated	
Measures, 1 qt.— $\frac{1}{2}$ bu., of wood	Vial trays for seed specimens
Measures, 1 pt.— $\frac{1}{2}$ bu. of metal	Type grains and grasses in head
Pie tins for seed testers, 2 doz.	Type grains and grasses in stalk
Plant press	Weed seed mounts.
Specimen bottles for seeds, metal screw cap, 4 drachm, 5 doz.	Last three supplied by Agronomy Dept. University of Wisconsin at cost
Seed containers of cardboard	
	Score cards, See appendix

#### Horticulture

To be supplied if horticulture is a local interest.

Bucket sprayer	Pruning knives, half dozen
Barrel sprayer, if much work is to be done	Pruning shears, long and short handles
Budding knife, one	Pruning saws, two
Grafting knives, three	Raffia
Grafting wax	Spade, shovel, hoes, rakes
Garden trowels, $\frac{1}{2}$ dozen	Spray material
Insect mounts	

Score cards. See Appendix

#### Animal Study

Babcock testing outfit complete	Glass cylinder for lactometer
The 12 bottle covered iron case form is strongly recommended	Incubator and brooder
Corrosive sublimate tablets	Lactometer, Quevenne
Cream scales, Torsion	Milk record sheets. Eau Claire Book and Stationery Co., and others
Drinking fountain for poultry	Milk scales, standard form
Egg tester	Churn, simple form
Farrington's alkaline tablets	Score cards. See appendix

#### Soils and Fertilizers

Drying oven	Soil tubes $\frac{3}{4}$ "x4' for capillarity experiments
Flower pots	
Jars, earthen for pot culture tests	Truog soil acidity tester
Soil sieves, $\frac{1}{2}$ —5 m.m.	Tall bottles with bottoms removed for drainage and water holding capacity
Soil thermometer	
Soil auger	

**Farm Mechanics and Farm Management**

(Including manual training)

- |  |   |
|--|---|
| Blue print paper   | Tools, see special list   |
| Drawing boards   | Tape line, 50'-75', in case, steel is desirable but not necessary |
| Gas engine, old one can usually be obtained at slight expense or for nothing | Two work benches, can be made                                     |
| 1 hand forge, if possible  | Yard sticks, 1 doz.   |

**General Purpose**

- |   |  |
|---|--|
| Chart cloth, painters' sign cloth or good quality white muslin        | Harvard trip balance   |
| Charts, Bricker Set of 10, Central Scientific Co.                     | Insect pins, Nos. 1, 3, 6  |
| Evaporating dishes, 3½", 4½"  | Lettering outfit for making charts, etc., A. Flanigan, 521 S. Wabash Ave., Chicago or N. W. School Supply Co., Minneapolis |
| File boxes for bulletins, \$6.00 per 100, H. Schulz & Co., Chicago    | Mason jars, 1 pt., 1 qt., clear glass  |
| Mortar and pestle, iron, 1 qt.  | Mortar and pestle 4", porcelain  |
| Passé partout paper for mounts  | Surgeon's absorbent cotton for insect and plant mounts   |
| Ricker insect and plant mounts, a few for samples, others can be made | Thermometers, chemical, several  |
| Scale, standard family  | Water baths, ½ doz.  |
| Cross cutter, steel   | For general apparatus see physics and biology lists in high school manual  |
| Graduated cylinders, 100 cc and 500 cc                                |  |

Drawing instruments may be purchased by pupils.

**REQUIRED LIST OF CHEMICALS**

- |   |                            |
|---|----------------------------|
| Acid, acetic                                    | Mehtylene blue             |
| Acid, carbolic                                  | Pepsin                     |
| Agar, Agar                                      | Phenol pht halein          |
| Bees' wax                                       | Plaster of Paris           |
| Bicarbonate of soda                             | Potassium iodide           |
| Calcium chloride, C. P. neutral (not calcined.) | Potassium hydroxide        |
| Copper sulphate                                 | Potassium cyanide          |
| Ferric chloride                                 | Rochelle salts             |
| Fuchsin solution                                | Resin                      |
| Gelatin   | Safranin                   |
| Hydrogen peroxide                               | Sodium chloride            |
| Iron sulphate                                   | Sulphur                    |
| Kerosene  | Starch                     |
| Litmus paper, red, blue                         | Tallow                     |
| Lead acetate                                    | Zinc sulfid, C. P. neutral |

In addition to the required lists of apparatus and chemicals given here the general lists called for under physics and botany are expected to be available. See High School Manual.

The following supplementary list, while not required at first, should be added as rapidly as possible as the course develops. The approximate cost of this list is fifty dollars, not including lantern outfit.

## SUPPLEMENTARY LIST OF APPARATUS

Acid tester for milk  
 Botany can for carrying plant specimens  
 Caponizing set  
 Cream separators. Can usually be secured at least as a temporary loan, through local dealers  
 Evaporimeter, for soil evaporation tests  
 Milk coolers  
 Milk sediment tester. Creamery Package Co., Ft. Atkinson or T. C. Lorenz Model Co., Madison  
 Moisture tester for butter  
 Opera glass for bird study, Chester Reed. Worcester, Mass., \$5  
 Pasteurizing outfit  
 Petri dishes 2 doz. 3"  
 Steam sterilizer  
 Lantern outfit with collection of slides. An excellent outfit with 50 slides can be obtained for about \$75.00

Companies handling scientific apparatus are now giving special attention to agricultural equipment. A number of these furnish special agricultural catalogs which by the cuts and descriptions give a good deal of help both in selecting apparatus for purchase and in giving ideas about homemade material. Much valuable equipment and illustrative material should be made or collected by teacher and pupils as rapidly as possible. The following list is suggested.

## HOMEMADE OR COLLECTED MATERIAL

Blue print frame.  
 Charts: pictures, diagrams, tabulated data. Many should be prepared by pupils in connection with class instruction and presentation of topics. See I. H. C. chart booklets for suggestions.  
 Painter's sign cloth or good white muslin serve as good material. Common manila paper may be used, but is not so durable.  
 Use the lettering outfit for tabulations.  
 Collection of seeds: weeds, grain, corn  
 Corn driers, trees, racks, strings, etc.  
 Corn judging boards, to hold 10 ear samples. See commercial catalogs for cuts.  
 Cyanide bottles,—for killing insects  
 Drawing boards  
 Frame for soil tubes,—capillarity and drainage experiments  
 Germinating boxes  
 Graft models,—see cuts in catalogs  
 Herbarium of weeds and grains  
 Hotbed and cold frame  
 Insect mounts,—on plan of Riker mounts  
 Insect net  
 Milk record sheets,—purchased at slight cost  
 Picture mounts of animals, etc. See below.  
 Plant press  
 Propagation bed 2'x3'



Rag doll testers. See charts below.

Seed corn testers, or germinating trays. See bulletins and catalogs

Samples of grains and grasses in stalk,—strip leaves

Soil samples: clay, sand, loam, muck

Weed or botanical mounts

Valuable help is given in the collecting and preserving of agricultural material in two recent bulletins of the U. S. Department of Agriculture.

a. Farmers' bulletin, No. 586. Collection and preservation of plant materials for use in the study of agriculture.

b. Farmers' bulletin No. 606. Collection and preservation of insect and other material for use in teaching agriculture.

### Bulletin Board

A most valuable aid in keeping up a vital interest in all the agricultural work and in developing an intelligent and progressive attitude toward the best and most recent improvements connected with good farming, is a bulletin board. This board should be a place for displaying any new and interesting agricultural materials which appeal to the eye. These might include pictures of animals, buildings or machinery, head lines or short articles on any farm topic, pictures of prominent men associated with farm movements, pictures of projects, farm demonstrations, exhibits, etc., recent world's records in any line, useful tables of farm data, etc., etc. The best in every line of farm progress should thus be kept before the pupils. These things may profitably be made the basis for the presentation of special topics from time to time.

Let the pupils themselves collect much of this material. Special committees of the pupils might have charge of the bulletin board each for a short period of a week or two. Material should be changed from time to time as new things are collected from agricultural papers or elsewhere.

A desirable size for such a board is 2' 8" x 3' 6". This board should be made of inch stuff and should be covered with brown or dark green burlap. Such a board can usually be made as a project in manual training. The bulletin board can do much to provide a stimulating farm atmosphere which should always exist in connection with this course.

### CHARTS

#### 1. Free or at a nominal cost.

While most of these charts have been published for free distribution it must be borne in mind that there is a possibility at any time that the supply may be exhausted, or that a charge may be made. A prompt request is most likely to secure them.

Agricultural Experiment Station, University of Wisconsin:

- Poster bulletin No. 1 Potato Diseases  
 " " No. 2 Standard Potatoes  
 " " No. 3 Prevention and Control of Hog Cholera  
 " " No. 4 How do you market your crops  
 " " No. 5 Help Fight These Weeds  
 " " No. 6 Improved Sandy Soils  
 " " No. 7 Test Your Seed Corn  
 " " No. 8 Save Farm Fertility  
 " " No. 9 Keep Cream and Milk Clean and Cold.

The Pure Bred Sire, Wisconsin State Live Stock Breeders' Association, A. W. Hopkins, Secretary, Madison.

Rag-doll Corn Test Chart. Crop Improvement Committee, Bert Ball, Secy., Board of Trade Building, Chicago.

Also furnished by I. H. C. Co., Harvester Bldg., Chicago.

Soil Chart and others of Wisconsin Geological and Natural History Survey.

Chart on Potato Diseases, Central Experiment Farm. Published by direction of Hon. Martin Burrell, Minister of Agriculture, Ottawa, Canada.

Cement Construction Charts. Universal Portland Cement Co., 208 S. LaSalle street, Chicago. Fine plans for cement construction and farm buildings. There may be a small charge for these.

I. H. C. Lecture Charts. International Harvester Co., Harvester Bldg., Chicago. Subjects treated are soils, corn, alfalfa, oats, live stock, poultry, weeds, the house fly, home economics, etc. These charts are loaned for a limited time at a small cost or they may be purchased. Sets of lantern slides may be obtained on similar terms. A prepared lecture booklet goes with each set of charts or slides.

## 2. Charts available by Purchase.

Bricker Agricultural Charts. Set of 10. Central Scientific Co., or Denoyer-Geppert Co., both of Chicago.

Nature Chart. Birds, animals, insects, etc., in colors. Very fine for birds. A. W. Mumford, Publisher, Chicago.

Agricultural Chart. R. O. Evans Co., Educational Publishers, Chicago.

I. H. C. Lecture Charts. See above.

## PICTURES AND LANTERN SLIDES

**1. Farm Animals.** Pictures of famous cattle and other farm animals can be obtained from farm papers and also by writing the different National Breeders' Associations. See appendix. Frequently pictures may be obtained by writing directly to noted breeders whose advertisements appear in farm papers, though the

demand often becomes too great for breeders to supply. The following have supplied fine pictures:

W. W. Marsh, Waterloo, Iowa, Guernsey cattle  
 Maple Crest Stock Farm Co., Kalamazoo, Mich., Holstein cattle  
 Adam Seitz, Waukesha, Wis., Ayrshire cattle  
 Dr. David Roberts, Waukesha, Wis., Holstein & Ayrshire  
 Jean Duluth Farm, Duluth, Minn., Guernsey & Red Poll  
 International Stock Food Co., Minneapolis. Horses

A very fine set of pictures of chart size  
 Pratt Food Co., Philadelphia, Pictures of stock.

Pictures of world's record animals may often be obtained by writing directly to the owners.

Pictures of fine stock may often be obtained at fairs or from advertising posters.

It is a good plan to have pupils construct charts by pasting good animal pictures on a piece of cardboard of convenient chart size, making one chart for each breed.

**2. Birds and other Nature Subjects.** The following furnish fine pictures in colors at from 1-3c each depending on number ordered. Subjects include birds, insects, animals, shells, minerals, etc.

A. W. Mumford, Publisher, Chicago  
 Perry Picture Co., Malden, Mass.

A very fine set of colored bird pictures is to be found in the National Geographical Magazine, June, 1913; May, 1914, and Aug., 1915.

The Chester A. Reed, "Bird Guides" are good for bird identification. Dobleday Page Co.

Arbor and bird day manuals since 1906 have fine bird pictures in colors.

**3. Lantern Slides.** A large variety of lantern slides adapted to agricultural instruction may be obtained from commercial firms such as Central Scientific Co., Welsch Scientific Co., or McIntosh Stereoptican Co. A number of sets of slides have also been prepared by other educational agencies. Some of these sets are loaned to schools for transportation or at slight cost. The following should be noted:

- a. U. S. Department of Agriculture, Office of Experiment Stations, Washington, D. C. Write for list of sets. Lecture with each set.
- b. Extension Department, University of Wisconsin; slides accompanied by lectures if desired.
- c. International Harvester Co., Harvester Bldg., Chicago.

## COMMERCIAL EXHIBITS

Many exhibits made by various manufacturing companies are valuable illustrative material for the agricultural work. However, many of the firms which have put out such exhibits have found it impossible to supply the demand and have discontinued the free distribution.

The following have supplied such material in the past:

- Cement. German American Portland Cement Works, 140 S. Dearborn St., Chicago
- Cereal products. Postum Cereal Co., Limited, Battle Creek, Mich.
- Corn products. American Mfg. Association of Products of Corn, Chicago
- Flour products. Washburn Crosby Co., Gold Medal Flour, Minneapolis  
Pillsbury Flour Mills Co., Minneapolis
- Fertilizer samples. Swift & Co., St. Paul or Chicago.  
Armour and Co., Chicago
- Flax. James McCutcheon and Co., Fifth Ave. at 34th St., New York.  
Free to High Schools and Colleges
- Grain. Commission of Immigration, Winnipeg, Canada. Samples of grains and grasses, in stalk and also threshed grain
- Limestone samples. Indiana Quarries Co., 112 W. Adams St., Chicago
- Milk products. Horlick's Malted Milk Co., Racine, Wis.
- Manila products. International Harvester Co.
- Minerals from German potash mines. German Kali Works, Monadnock Bldg., Chicago. Not available at present.
- Nitrate industry. Chilean Nitrate Propoganda. 25 Madison Ave., New York
- Packing industry. Morris and Co., Chicago; Armour and Co., Chicago
- Petroleum products. Standard Oil Co.
- Steel. Illinois Steel Co., South Chicago
- Wood finishing. S. C. Johnson and Son, Racine, Wis. Small wood panels finished in different ways

## MISCELLANEOUS HELPS

- Literature illustrated with many fine pictures and cuts. Free except as indicated.
- Ohio Agricultural Experiment Station, Wooster, Ohio, Bulletin No. 122—"Testing the Dairy Cow."
- International Harvester Co., Harvester Bldg., Chicago. "The Golden Stream" (Dairying) and other booklets on alfalfa, sweet clover, corn, poultry, farm machinery, etc. Send for complete list. 1—3c each.
- National Breeders' Associations. Pictures and literature. See appendix
- Van Pelt's "Cow Demonstrations" and Kimball's "Dairy Farmer" Waterloo, Iowa, \$1.00
- Feeding Dairy Cows. Booklet by T. L. Haecker, No. 130, Revised and Enlarged, University of Minnesota. Department of Agriculture, St. Paul, Minn.
- School Garden Association of America, Dayton, Ohio. Literature and Bibliography

- The Children's Flower Mission, Cleveland, Ohio. Trees, Shrubs, Penny-packet seeds for children's gardens. Literature on school gardens
- Wm. S. Meyers care Chili Nitrate Co., New York City, 71 Nassau Street, Book on Manufacture of Nitrates
- Middle West Soil and Improvement Committee, Chicago, Ill., 916 Postal Telegraph Bldg., literature on "Canner's Crops" and other topics
- Universal Portland Cement Co., Chicago, Ill., 72 W. Adams St., "Farm Cement News"
- German American Portland Cement Works, Chicago
- Vulcanite Portland Cement Co., Philadelphia
- Association of American Portland Cement Mfgs., Philadelphia, Pa., "Manual on Cement"
- Park's Floral Magazine, La Park, Pa.
- Seed Catalogs. See advertisements in farm papers
- Stark Bros., Nurseries and Orchard Co., Louisiana, Mo., Stark "Orchard Book" and other literature
- Wing Seed Co., Mechanicsburg, Ohio. Literature on "Alfalfa"
- C. M. Parker, Taylorsville, Ill., series on "Studies of Agriculture"
- Western Michigan Development Bureau, Travers City, Mich. J. I. Gibson, Publications on "Development of Western Michigan"
- Wisconsin Advancement Association, 1505-1511 First National Bank Bldg., Milwaukee, Wis., monthly bulletin 50c, and other literature
- Wisconsin Soil Survey, College of Agriculture, Madison
- Crop Improvement Committee, 64 Board of Trade, Chicago. Farm literature and rag-doll tester
- Silver Mfg. Co., Salem, Ohio. "Modern Silage Methods"
- J. I. Case Threshing Co., Racine, Wis. "Science of Successful Threshing"
- Holm and Olson Park Nurseries, St. Paul, Minn. Catalog on Landscape Gardening
- Chas. E. Greening, Monroe, Mich., Greening's "Pictorial System of Landscape Gardening"
- Martin Mfg. Co., Sac City, Iowa. Wire corn rack
- Buffalo Fertilizer Co., Buffalo, N. Y. Literature
- The Alfred J. A. Brown Seed Co., Grand Rapids, Mich. Literature on "Alfalfa"
- Creamery Package Mfg. Co., Chicago, Minneapolis and Ft. Atkinson, Wis. Catalog of dairy supplies. Ask especially about the Wizard Sediment Tester
- Michigan Bird Book. Cloth 60c, paper 40c; Secy., Agricultural College, East Lansing, Mich.
- Michigan Book of Trees. Geo. Wahr, Ann Arbor, Mich.
- Ware Bros. Co., Philadelphia. "The American Fertilizer Handbook" \$1.00
- Deere and Co., Moline, Ill., "Soil Culture and Modern Farm Methods"
- James Mfg. Co., Fort Atkinson, Wis. Book on "The James' Way" in modern barn equipment. Also Barn Magazine published several times a year
- Northland Hemlock and Hardwood Mfg. Association, Wausau, Wis.
- London Machinery Co., Fairfield, Iowa
- King Ventilating Co., Owatonna, Minn. Catalog and literature
- American Steel and Wire Co., 72 W. Adams Street, Chicago
- German Kali Works, 1901 McCormick Bldg., Chicago. Books on agricultural subjects
- American Corn Mfg. Co., 1236 National Bank Bldg., Chicago. Literature and exhibit

- Natural Phosphate Co., Chicago, Ill.  
 Michigan Weeds, Beale, Bulletin No. 267, Michigan Agricultural College  
 Seeds of Michigan Weeds, Beale. Bulletin No. 260. Michigan Agricultural College, E. Lansing  
 Live Stock Judging for Beginners. Cir. No. 29, Agr. Exp. Sta., La Fayette, Ind.  
 Central Scientific Co., Chicago, Catalog X, Agricultural apparatus  
 W. M. Welsch Scientific Co., Chicago, Agricultural catalog  
 McIntosh Stereopticon Co., Chicago, Lanterns and lantern slides  
 Bausch and Lomb, Rochester, N. Y. Lanterns, slides, optical instruments, microscopes, general apparatus  
 Spencer Lens Co., Buffalo, N. Y. Microscopes and general biological apparatus  
 Stamping and Tool Co., La Crosse, Wis., Badger Stereopticon Outfit  
 Chart. Breeds of English Sheep. Wm. Cooper and Nephews, 64 W. Illinois Street, Chicago  
 Spraying Chart and Insects. Campbell-Udell Chemical Co., Grand Rapids, Mich.

#### MANUAL TRAINING EQUIPMENT

It has already been urged that every high school offering the agricultural course should be equipped with at least two benches and necessary tools for carrying on manual training work related to the farm. Accompanying this there should be wherever possible some forge work. Pupils should be held responsible for careful, accurate work, although they may be left to do much of the work by themselves. It may not always be necessary that a special class should be organized although this is very desirable. Furthermore, while some excellent work can be accomplished with only two benches and two sets of tools, it is very desirable that schools that can afford it should supply a larger number,—say from six to twelve benches. The following list of tools is suggested as the minimum list for the equipment of two benches. Most of the items where 2 units are called for should be increased according to the number of benches, if more benches are added.

#### Suggested Minimum List for Woodwork

(2 benches)

- 2 Skeleton benches with rapid acting vise
- 2 Jack planes
- 2 Sloyd knives, 2½" blade
- 2 Try squares, 6"
- 2 Squares, combination 9" blade, hardened without center head. (It is worth while to have all the squares of this type)
- 1 12" back saw
- 2 Screw drivers, 5" blade
- 2 Marking gages
- 2 1" chisels, bevel edge, cabinet or pocket type
- 2 2 ft. two fold rules No. 18
- 2 Bench dusters

- 1 Pair 6" wing dividers
- 1 Smooth plane 9"x2" cutters
- 1 Block plane
- 1 India oil stone, fine, 6"x1 $\frac{5}{8}$ "x $\frac{3}{4}$ ", in wooden box
- 2 Nail sets
- 1 Set twist wood bits
- 1 Spokeshave new style, adjustable cutter
- 1 Round blade, screw driving bit, 3/16"
- 1 12" keyhole saw
- 1 Ratchet brace
- 1 Round hickory mallet
- 1 Pair combination pliers
- 2 Crosscut saws, 10 points
- 1 Ripsaw, 8 points
- 1 Steel carpenter's square (rafter brace board measure)
- 1 Each Jennings Auger bits,  $\frac{1}{4}$ "  $\frac{3}{8}$ "  $\frac{1}{2}$ "  $\frac{5}{8}$ "  
 $\frac{3}{4}$ "  $\frac{7}{8}$ " 1"
- 1 Auger bit file
- 1  $\frac{1}{4}$  pt. oiler
- 1 Each, chisels, bevel edge, cabinet type,  $\frac{3}{4}$ ",  $\frac{1}{2}$ ",  $\frac{3}{8}$ ",  $\frac{1}{4}$ ",  
 $\frac{1}{8}$ "
- 2 10 oz. hammers
- $\frac{1}{2}$  doz. Jorgensen hand screws open 8"

**Equipment for Forge Work**

(with approximate cost)

1 Champion, 30"x30", No. 407 Forge, Catalog A, page 438....	\$25.00
This may be purchased of the Western Iron Stores Co., Milwaukee, Wisconsin	
A good substitute for the forge above specified may be secured of the Sturtevant Company, Oliver Machine Company, or the Grand Rapids School Equipment Co.	
1 Anvil, not heavier than 100 lbs., and not of the horse shoeing type .....	12.00
1 Blacksmith vice, 4 $\frac{1}{4}$ " jaw.....	6.00
1 Sledge, 3 to 5 lbs.....	.75 to .90
4 Pair Tongs, (assorted).....	2.00
1 Flatter .....	.50
1 each, hot and cold cutter.....	1.00
1 1 $\frac{3}{4}$ lb. hammer .....	.65
1 2 lb. hammer.....	.70
1 Hardie .....	.20
1 top and bottom $\frac{1}{2}$ " fuller.....	1.00
<hr/>	
Total.....	\$49.00

Some of the forge making tools may be made. See outline of work under "Manual Training."

Further information on tools, machine and equipment may be had by applying to the State Department of Public Instruction.

**Equipment for Leather Work**

For leather repairing the following are needed: Sewing horse (may be made), harness makers thread and needles, pricking wheel, edging tool, round knife, stitching awl, cobbler's wax.

## VII—AGRICULTURE IN THE GRADES

In order that extra state aid may be obtained for agriculture in the grades, it is necessary that instruction be given to the seventh and eighth grades by a specially qualified teacher for at least eighty minutes a week. More than the minimum time ought to be given for the best results.

Unless the classes are very large, the two grades may be combined for this work. A plan for both grades should be worked out and then the work for each grade should be given on alternate years,—i. e. seventh grade work would be given to both grades one year and eighth grade work the next; thus both classes would be carried through the two years' work.

The general plan should provide first, for practical work in which each pupil actually carries out under the direction of the teacher some agricultural project adapted to his age and home conditions, and second, it must provide for elementary classroom instruction related as closely as possible to the project work and to the work going on at the homes of the pupils. The practical work is of main importance and great care must be exercised that the classroom instruction is made simple enough and concrete enough to be within the understanding of the pupils. The character of the work should be determined by home conditions. Subject matter should follow the seasonal arrangement.

A school exhibit in the fall of products produced by the pupils should be an important feature. This may be made a part of the high school "Harvest Festival." A financial account should be required of each pupil. (See project work for the high school.)

It is best not to try to cover all the topics of a general course, but rather confine the work to a few subjects which are of greatest local interest and most closely related to the home experiences of the pupils. In general treat the topics of soil and plants in the seventh grade plan, and animal study in the eighth. However, the plan should be to give a course in general agriculture rather than one specialized into different subjects. A good text should be in the hands of the pupils for the assignment of lessons as the work demands. The greater number of lessons should, however, be in the field or garden or working with materials about tables or at the desks inside. See list of general texts in this manual.

In school having the six-year high school plan or the junior high school, it is expected that closely correlated courses will be worked out for the whole six grades. The plans worked out here will adapt themselves readily to this arrangement.

Detailed outlines of work for the seventh and eighth grades have been published by this department in the Common School Manual and



in a special bulletin on "Course of Study in Elementary Agriculture for the Wisconsin Rural Schools." These publications will furnish abundant suggestions for outlining work for grades connected with the high school. Look up especially the outlines in the Common School Manual, Sixteenth edition, completely rewritten in 1916, pp. 185-201. The course of study above referred to will be found valuable also especially in working out seasonal details.

The following general plan is suggested here:

Details should be worked out to best meet local needs and conditions.

### Seventh Grade

1. Gardening
2. Study of corn or potatoes
3. Weeds for acquaintance and identification
4. Hotbed work
5. Practical projects in gardening
6. Bird study

### Eighth Grade

1. Weeds,—reviewed and extended
2. Landscape and floral gardening.
3. Poultry raising
4. Dairying
5. Class projects in gardening, poultry raising or dairying
6. Individual projects in gardening, poultry raising or dairying
7. Bird study, continued.

Many of the suggestions regarding methods of work for the high school are applicable here also, but great care should be taken to adapt the work to the stage of development of the grade pupils.

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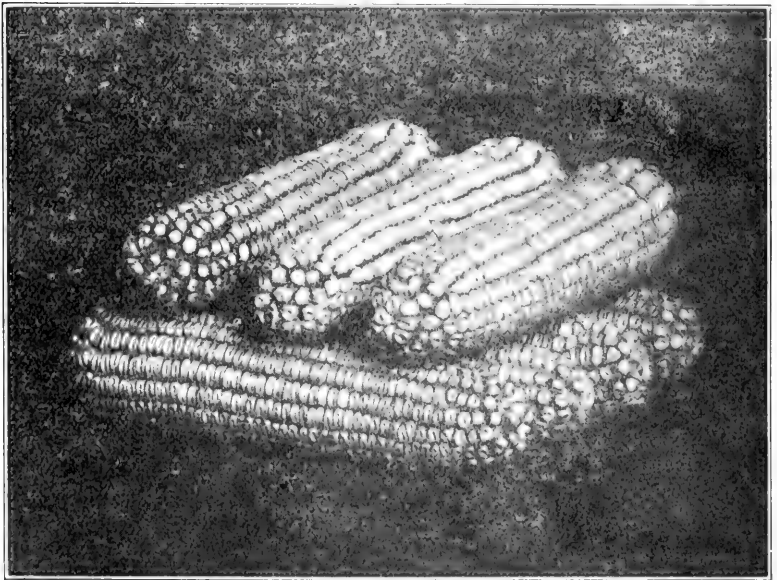
## VIII—TREATMENT OF SUBJECTS

### ELEMENTARY SCIENCE

**A. General Suggestions.** This course has proved a good introduction to the agriculture course. It should deal mainly with the physical side including the simpler topics of physics and chemistry. These should be treated largely from the real or phenomenal side and very little from the theoretical. The treatment should be so simple and popular that it will appeal strongly to the interests and capacities of first year high school pupils. The materials used should be first of all the common things which constitute the every day surroundings of boys and girls. For example, in beginning the study of electricity, the



ALFALFA DEMONSTRATION ON SCHOOL PLOT AT ROBERTS.



PURE BRED GOLDEN GLOW CORN RAISED ON SCHOOL PLOT AT VIROQUA.

electric bell, the electric flatiron, electric lights or electric street cars should furnish the starting point, rather than the voltaic cell or a Holtz machine. Logical treatment of subject matter from the point of view of the mature student should be given little consideration at first. As the work proceeds there should be some organization, but great care should be exercised to see that this organization is in units simple enough and concrete enough to be fully grasped by the young mind. The starting point of instruction should be the familiar experiences and situations of the pupils themselves, not definitions or generalized statements. Every effort should be made to lead pupils to consider familiar situations which arouse problems and lead them to think. Methods for working out these problems by experiment or otherwise should be thought out as far as possible by the pupils themselves under the skillful questioning and guidance of the teacher.

No fixed set of experiments should be required and no laboratory directions should be put into the hands of pupils. Experiments should follow the lead, at least to a very large extent, of the problems which the interests of pupils bring up, and these experiments should be performed to a large extent as class demonstrations by the teacher assisted by the pupils. Some of the simpler experiments may be done by pupils at home or in the laboratory. No regular laboratory period should be required.

A textbook should be in the hands of pupils, but lessons should be assigned in it not at the beginning of a topic, but as a source of information for the rounding up of a topic after pupils' experiences and classroom demonstrations have been utilized in connection with the development of thought. The assignment should often ask pupils to look up something at home or in some shop or try out some experiment rather than to learn a lesson from the book. Pupils should be trained to go to many sources of information in their effort to work out their problems. Very little organized information should be given on the lecture plan. Neither should the teacher attempt to give information in answer to pupils' questions, when the pupil himself could be stimulated to further profitable study by being shown how to look up the question for himself. Frequently a question may raise a fine topic for some pupil to look up and report on to the class at some later lesson. The teacher should, however, answer questions at times, when it is needed to promote discussion or prevent waste of time on the part of the pupils. The spirit of the class should be that of teacher and pupils working together to solve problems and develop an understanding of common things. In this study the order of topics as well as any particular arrangement of subject matter are relatively unimportant. The pupils' interests and surroundings should rather be the guide. There should, however, be carefully planned work at certain stages in rounding up definite and accurate knowledge and in making wider applications. There is no subject that should arouse greater interest and enthusiasm on the part of the pupils. Failure to get this is an indication of poor teaching. For further suggestions

on methods of presenting this subject see High School Manual under "Science."

### B. General Outline of Topics

Air, water, fire, rocks, soils.

Heat, light, sound, electricity, magnetism.

Heating systems of houses, stoves, furnaces, thermostats.

Household conveniences: water systems, gas stoves, electric light, meters for gas and electricity, telephone, electric flatirons, electric bells, plumbing system.

Electric cars, power plants, dynamos, motors.

Simple machines; pulleys, teeter boards, wheelbarrows, wagon-jacks, derricks, windmills, etc.

Gasoline engines, tractors, automobiles, milking machines, air ships.

Common water pump, bicycle pump, gasoline pump, etc.

Ventilating systems; by windows, by furnaces, by fan.

Rainbows, shadows, mirrors, lenses, cameras, the microscope, glasses, colors.

Echoes, musical instruments, telephones.

Clouds, rain, snow, frost, winds, storms, weather, thunder, lightning.

Simple ideas of matter, energy and force.

Common elements and compounds.

Burning, oxidation, fermentation, decay, bleaching, dyeing, etc.,

Acids, bases, salts, neutralization.

Chemical substances of the home: soda, baking powder, soap, paints, washing powders, etc.

Common metals: properties, uses, solubilities, ores.

Medicines and disinfectants: alum, blue vitrol, salt petre, epsom salts, alcohol, ether, formaldehyde, carbolic acid.

Poisons: arsenic, Paris green, corrosive sublimate, etc.

Patent medicines: composition, effect on the body, sale and abuse.

Common manufacturing processes: soap, glass, pottery, explosives, bread making, etc. Visit any local plants.

Foods and beverages: composition, value, effect on the body.

Alcohol and its effects on the human system.

Biographies and achievements of great scientists and inventors.

Secure pictures if possible. Have pupils present special topics.

**C. Special Suggestions on Treatment of Topics.** A few illustrations are here given to show how the problem method may be used and how the common and familiar experiences of pupils may be made the starting point in developing any topic. Technical terms, definitions and theories come in connection with the final organization of pupils' knowledge, rather than as a part of the first development. Ideas are developed first and then the appropriate term may be presented as a label for the idea. Abundant drill should be given to fix the association between new terms and ideas to which they belong.

### Lever

Begin by asking pupils how a teeter board is operated. Develop ideas before giving any new terms or asking for any definitions.

Help pupils to get a clear idea of the rigid board, the fixed axis and the weight at each end.

By questioning develop the idea that the child who is down has to be lifted and therefore becomes the weight, while the child who is up tends to fall by gravity and thus becomes the power.

Now ask for names to apply to the ideas developed and label each idea with its appropriate name including,—lever, fulcrum, point of attachment of power, point of attachment of weight, weight arm, power arm.

Construct a drawing on the board, label each part and then give a lively drill to associate each idea with its proper name. Erase the names and continue the drill by pointing to different parts and asking for names until all are well fixed in mind. Review this drill briefly on a number of successive days.

Next get pupils to consider how the position of the fulcrum ought to be changed when children of different weights are using the board, (1) effect of moving the board so as to change the fulcrum, (2) effect of changing the point where the heavier child sits.

Have suitable apparatus at hand for demonstrating and testing experimentally whether pupils' answers are right. Use weights and spring balances.

Develop many simple problems, e. g. (1) If the persons at the ends are of equal weight where ought the fulcrum to be? (2) If one child weighs twice as much as the other how should the weight arm and power arm be arranged? Keep these problems simple enough so that pupils can think the actual conditions clearly. Do not use any formula until the thinking involved has been thoroughly mastered.

Drill on a large number of simple oral problems such as this: If the weight arm is 3 times the power arm, what power will be necessary to just balance a weight of 1 pound? Vary this in many ways.

Finally develop the formula for the lever:  $Pp = Ww$  where  $P =$  power,  $W =$  weight,  $p =$  power arm and  $w =$  weight arm.

Develop other levers in a similar way such as wheel barrow, crowbar, shears, steelyard, nut cracker, derrick, forearm, etc.

Finally the three classes of levers may be developed by considering the variations in the arrangement of power, weight and fulcrum.

Observe that this should come as a part of the final organization of the pupils' knowledge rather than as a topic to be taken up first. Notice also that a problem method has been followed throughout this development, calling for good thinking at every step rather than for memory work. Furthermore, the development begins with the pupils' familiar experiences rather than with what is new and unknown.

### Light

1. Common ideas of light. Begin by considering the common ideas of day and night, showing that our idea of dark is simply absence of light.

Impression of looking into a deep hole, how we distinguish objects from each other, light and dark sides of buildings, etc.

How we get light: sun by day, candles, electric lights, gas light, moon and stars, fire works, bon fires, red hot iron, etc.

What light does for us: enables us to see, gives us beautiful colors, enables us to make photographs, kills disease germs.

2. How material objects affect light: glass, coal, stone, wood, glue, paraffin. Why we have windows in houses, isinglass in stoves, etc. Develop the ideas of transparent, opaque, and semi-transparent or translucent and then apply these names. Drill in associating names and ideas. Develop the notion that objects that do not let light go through must either take up the light (absorb) or turn it back (reflect). After developing the ideas apply the terms and drill on their use. Develop the meaning of the word "reflect" in relation to the idea.

3. Mirrors. Develop the common use of the plane mirror. Have one ready to use for demonstration. Where does a person stand in relation to a mirror to see himself? Demonstrate where the image is shown when the person stands at one side. Compare with the action of a ball bounded against a plane surface.

Demonstrate in many positions. Show on the floor of the room the line of the incident light, the line of the reflected light and the line of a perpendicular to the mirror. Then compare the two angles and apply the correct name to each.

Now illustrate the same by drawing at the board. Drill on the use of the terms incident rays, reflected rays, perpendicular to the reflecting surface, angle of incidence, angle of reflection.

Where does the image seem to be? Develop the idea that light moves in straight lines in the air or any other medium of uniform density. Show by drawings how the image seems to be back of the mirror.

If concave and convex mirrors are available try the effect of each on the appearance of an image and raise the question why the image is distorted. Avoid too great difficulties in this. Let pupils think it out or leave it as an interesting problem for later study.

Lead the class to discover the reversal of right and left sides in the image seen in a mirror. See if the pupils can develop an explanation.

4. Approach the subject of refraction through the experiment of a stick placed obliquely in a flat dish of water. Develop the idea of media of different densities. Show the possible error of locating a penny in the bottom of a dish or pond of water. Develop the law to show how rays are bent in passing from a medium of one density to another of different density.

5. Demonstrate how colors are produced by passing light through

a triangular prism. Pupils will have to be told or will have to learn from a book that white light is composite and composed of different colors. See if pupils can't then develop a theory of how the colors are formed.

6. Colors of objects. Review the ideas of transmission, absorption and reflection of light. Demonstrate colors by the use of both transparent and opaque colored objects and lead pupils to work out an explanation of how objects may appear white, black, or with any of the colors. Lead pupils to give simple explanations of rainbows, colors in soap bubbles, etc.

7. Round up the whole subject, drill on the use of new terms and see that pupils can explain what they have learned in clear and accurate language.

8. A study of the camera and how pictures are taken may be made especially interesting. Follow the problem method starting with situations and observations rather than with definitions or theories.

9. Take up intensity of illumination and measurement of light only after considerable work has been done with the commoner phenomena of light.

10. Lenses, may be studied in a similar way. Their action should be worked out in connection with the human eye, the microscope and the use of glasses to correct imperfect vision. Demonstrate how images become inverted in using lenses and how lenses have to be focused. Do not spend time to work out and explain complex drawings here. Leave something for later work in Physics. Get pupils to observe and understand as well as they can the actual phenomena rather than complicated figures.

### FARM PLANT LIFE

**A. General Suggestions.** The first semester of work presents wonderful opportunities for practical work. The seasonal element must be considered and no portion of the work presents greater opportunities to interest the young people and to reach the parent. The early part of the semester will probably be given to field and garden seed identification, germination, plant propagation, projects, etc. The hotbed and cold frame should be made in the fall if possible but may be constructed in the spring. Plans must be made for the school and home gardens and the teacher and pupils must produce as good a product as produced at home and at an earlier date. Early vegetables are welcome in every home and therefore the hotbed and cold frame should have a place in connection with every garden. It is your work to demonstrate its practicability. In every community there are orchards that may be pruned, sprayed, etc. This large amount of practical work will require careful planning on the part of the teacher in the arrangement of subject matter as well as the time in school hours to do the work.

The home projects will require considerable time and should be arranged early in the semester. The discussion of plans for individual projects, together with methods of operation are legitimate and necessary types of recitation. Every topic suggested presents some form of a home project. The greatest mistake we may make is in not planning the work early in the season. This is in reality the planning of the summer school work. In doing so the fall festival or fair must be remembered. An abundance of illustrative material is available for the work in farm crops.

In the fall the study of weeds will probably be given first place but the selection and curing of seed corn, grain, potatoes, etc., must be taken seasonally. The selection, packing and marketing of fruits, together with the fall care of trees and shrubbery will also be necessary before frost. The study of the points of the score card and judging may be left until winter. Collections and exhibits of grains, grasses, corn, potatoes; diseases of trees, fruits, vegetables, grains; weed mounts, weed seeds, etc., must be made for winter and spring work. Every school should be provided with bottles, shelves, etc. for this material and each instructor should make the collection of such a supply of laboratory material.

Study the present and future needs of your community and determine the relative amount of time that should be given to each topic. Potatoes and corn may both be of interest but the former of great importance in some localities. In another section, corn and the small grains will be emphasized and potatoes be incidental. The following outline is suggestive of the work that should be done in Farm Plant Life.

## **B. General Outline of Farm Plant Life**

### **1. Second Semester—First Year**

- Propagation of plants by seeds, division, cuttings.
- Study of seed catalogs and ordering seed.
- Grafting, budding, grafting materials.
- Pruning and spraying of trees, shrubbery, vines, etc.
- Collection, identification and methods of planting farm and garden seeds.
- Treatment of seed for planting.
- Germination tests of garden and field seeds.
- Planning orchard and planting of small fruits, shrubbery, trees.
- Hotbed and cold-frame construction and operation.
- Use of flats, compost, transplanting, proper soil tillage, etc.
- Study of common diseases of plants and treatments.
- Collection, life history and control of insects.
- Beekeeping.
- School and home gardens.
- Acquaintance with seedlings,—farm and garden plants, weeds.
- Orchard care and management—rejuvenating the old orchard.



Nursery stock selection and care.  
 Greenhouse work.  
 Plant forcing, double cropping, etc.  
 New garden and field crops for the community.  
 Decorative planting of trees, shrubbery and flowers on school grounds and at home.  
 Assignment and study of projects for home work.

## 2. First Semester—Second Year

Weeds:—identification of plant and seeds, eradication, mounts, weed laws. Practical use of keys for identification. Learn to know 100 weeds. Mount plants and seeds.  
 Seed inspection,—laws, methods.  
 Selection, curing and storage of seed corn, potatoes and small grains.  
 Fall and winter care of fruits, flowers and vegetables.  
 Crops:—seed, methods of planting, care, harvesting, selection of seed, etc., of the following crops—corn, potatoes, wheat, oats, barley, rye, etc. Collect specimens of plants and seeds.  
 Plant breeding.  
 Score card study and judging of potatoes, corn, grains, fruits and vegetables.  
 Special crops:—beets, tobacco, hemp, buckwheat, etc.  
 Meadows:—grasses, seeding, care, etc.  
 Pastures and pasture grasses.  
 Marketing of farm crops.  
 Legumes:—clovers, alfalfa, soy beans, cowpeas, vetches, field peas, etc.  
 Fall festival or fair.  
 Completion of home projects.

## C. Typical Outlines of Farm Plant Topics

### FRUIT

The following outline is suggestive of the work that may be done with fruit in high school classes. Similar outlines should be made by the teacher on gardening, seed work, etc. This survey of the field with type laboratory and demonstration exercises is made with the apple orchard particularly in mind. Local conditions must be considered in using the outline.

**1. Survey:** A survey of the tree and bush fruits of the community should be the first work. This should consider the varieties grown, fall and winter care, diseases, new fruits and opportunities for a greater development in this line. If a commercial orchard is within driving distance a visit should be made as early as possible.

### 2. Demonstration Work By The Teacher

- a. Construction and use of pruning tools.
- b. Pruning trees, bush fruits, grapes, etc.
- c. Caring for wounds.
- d. Construction and manipulation of spraying machine.
- e. Grafting and budding.

### 3. Laboratory and Field Work

a. Choosing the Orchard Site: Make a trip to the country and select desirable and undesirable sites. Visit farm orchards and discuss advantages of sites.

b. Selection of Varieties: Get as many samples of fruit from the community as possible. Have pupils identify the varieties of apples, etc. Secure the recommended fruit list of the Wisconsin State Horticultural Society. Secure fruit samples or colored pictures from catalogs of these varieties so pupils may become familiar with characteristics. Send for catalogs.

c. Selecting Stock: Study catalogs. Visit a nursery if possible.

d. Planting the Orchard: Obtain permission from some one about to plant some trees, so class may assist under direction of teacher and owner. Demonstrate pruning necessary at planting. Run check if possible. In school yard demonstrate the advantages of the different types of planting using stakes for trees.

e. Orchard Soil Management: Visit local orchards noting conditions and effects of soil management. Secure a small orchard and mulch a part as a demonstration, etc.

f. Pruning: Secure orchards near the school and do pruning and spraying under the direction of the agricultural teacher. Start demonstration on school ground showing possibilities of heading trees.

g. Spraying: Spray fruit trees. Let each student have a turn at the actual work. Continue the work suggested in e and f on demonstration orchard. If possible study disease conditions in sprayed vs. unsprayed orchard. Make sample lots of spray materials.

h. Marketing: If in a commercial fruit section, emphasize this and study methods used in large fruit districts. If a commercial orchard is not available, make tables and arrange to do selection and packing for some patron.

i. Propagation: If no school plot is available, arrange to assist in starting grafting and budding, and other types with geraniums, etc. Have pupils construct graft models. See scientific catalogs for suggestions.

j. Rejuvenation of the Old Orchard: Visit old orchard. Suggest changes and secure portion for class work.

k. Small Fruits: (See propagation) Start strawberry bed for someone. Let each pupil handle some of the plants. Insist on adherence to careful work. Follow suggestion for practical work of b to j as applied to small fruits. Select complete and incomplete strawberry plants.

l. Identification of common pests as Coddling Moth, San Jose Scale, Aphis, Borers, Apple Scab, Fire Blight, etc. Teacher should have specimens ready for examination in laboratory.

### 4. Organization of Subject Matter

a. Choosing the Orchard Site. S. p. 8-24; G. p. 7-29; B. p. 38-63; Wis. Bul. No. 201, p. 6-15

(1) Exposure. S. p. 12

(a) North or North West slope

(2) Elevation

(a) Above surroundings

(b) Air drainage

(3) Soil G. p. 7-10; S. p. 9-11; B. p. 13-20

(a) Character of surface soil

(b) Depth of surface soil

(c) Character of subsoil

- (d) Fertility
  - (e) Possibility of drainage
  - (f) Adaptability to fruit to be grown
  - (4) Convenience (if home orchard)
  - (5) Wind breaks
  - (6) See suggested laboratory work
- b. Selection of Varieties. S. p. 24-43; W. p. 96-108. Wis. Bul. No. 201, p. 33-34
- (1) Depends on:
    - (a) Use of fruits
    - (b) Special adaptability
    - (c) Resistance to disease
    - (d) Cross fertilization
    - (e) Personal preference
    - (f) Popularity
  - (2) For Home Orchard
    - (a) Large variety
  - (3) For Commercial Orchards
    - (a) Few varieties
    - (b) Well known varieties
    - (c) Those which are in demand
    - (d) Those which are showy
    - (e) Hardy and will stand shipping
- c. Selecting the Stock. S. chap. 3; Wis. Bul. No. 201, pp. 16-25
- (1) Consider age, trueness to type, freedom from defects. W. pp. 22-26
  - (2) Suggestions for the buyer
    - (a) Buy direct from nursery if possible
    - (b) Beware of agents
    - (c) Know fruit
    - (d) Order early
    - (e) Refuse culls
    - (f) Stick for good stock
    - (g) Refuse substitutions
    - (h) Price
    - (i) Age of trees
  - (3) Care of trees upon arrival
    - (a) When delivery should be made
    - (b) Heeling in
- d. Planting the Orchard. S. chap. 4; Wis. Bul. No. 201, pp. 25-33
- (1) Planting plans S. pp. 46-47
    - (a) Square
    - (b) Quincunx
    - (c) Alternate
    - (d) Hexagonal
  - (2) Distance between trees. S. pp. 58-59; W. pp. 27-34
    - (a) Kind of fruit
    - (b) Location
    - (c) Soil
    - (d) Methods of pruning
  - (3) Laying out the Orchard. S. pp. 47-49
    - (a) Furrows
    - (b) Wires
    - (c) Lining in

- (4) Setting the trees. S. pp. 51-63; W. pp. 34-36
  - (a) Planting boards
  - (b) Size of hole
  - (c) Root pruning
  - (d) Root distribution
  - (e) Filling the hole
  - (f) Avoid fertilizing young trees
  - (g) Do not water unless very dry
  - (h) Top pruning
  - (i) Protection from sun and rodents. G. pp. 31-35
- (5) Time of planting. S. pp. 53-54; W. pp. 36-37
- (6) Fillers for young orchard
  - (a) Small fruits
  - (b) Vegetables
- e. Orchard Soil Management
  - (1) Orchard Cropping. S. pp. 67-76; B. 102-106
    - (a) Objects
    - (b) Crops that may be grown
    - (c) Must not reduce fertility
    - (d) Danger of injuring trees
  - (2) Mulching System. S. pp. 78-80; W. pp. 39-43; B. pp. 80-90
    - (a) Sod mulch,—advantages, disadvantages
    - (b) Half sod mulch. For extremely sloping region
    - (c) Definite mulch,—advantages
  - (3) Tillage System. S. pp. 81-93; B. pp. 64-80; 91-102
    - (a) Prevalent method
    - (b) Details
      - Shallow plowing, harrowing, tilling to preserve dust mulch, killing weeds, etc.
    - (c) Advantages
      - Aerates the soil, helps make available plant food, conserves the moisture
  - (4) Cover Crops. S. pp. 107-118; B. pp. 109-128; W. p. 43
    - (a) Requisites of a good cover crop
      - Should make easy catch, should be a rapid grower, should be persistent
    - (b) Classes of cover crops
      - Food supplying hardy, food supplying tender, nonfood supplying hardy, non-food supplying tender, and tender top and hardy roots
    - (c) Manipulation of cover crop, time and method of sowing, plowing, etc.
  - (5) Fertilization. S. pp. 100-106; W. pp. 48-57; B. p. 128
    - (a) Trees exhaust the soil
    - (b) Best orchardists fertilize
    - (c) Farm manure valuable
    - (d) Influence of nitrogen, potash, phosphoric acid, and calcium
    - (e) Artificial fertilization,—forms to use and application

- f. Pruning. S. pp. 119-141
- (1) Tools. S. pp. 129-134; W. pp. 72-75
    - (a) Pruning saw
    - (b) Pruning shears
    - (c) Pruning knife
  - (2) Reasons for pruning. S. pp. 119-128; W. pp. 58-60
    - (a) Growth
    - (b) Yield
    - (c) Sunlight
    - (d) Protection
    - (e) Harvesting
    - (f) Rejuvenation of old stock
    - (g) Control disease
  - (3) General rules of pruning. W. pp. 60-62
    - (a) The best pruning varies with conditions
  - (4) When to prune. S. pp. 137-139; W. pp. 62-70
    - (a) Dormant pruning
    - (b) Summer pruning
    - (c) Pruning roots and tops at planting time
    - (d) Forming the head
    - (e) Cutting out large branches
  - (5) How to prune. S. pp. 135-136; W. pp. 70-72
    - (a) Pruning the year old tree
    - (b) Pruning the two year old tree
    - (c) Pruning the three year old tree
    - (d) Pruning the older trees
  - (6) Wounds made by pruning. S. pp. 139-141
    - (a) Proper cuts in removing branches and in heading back
    - (b) Protecting wounds
- g. Spraying,—reasons for. W. pp. 76-77
- (1) Controls insects. S. pp. 142-161; G. pp. 45-73; W. p. 79
    - (a) Chewing or biting insects,—internal feeders and external feeders
    - (b) Sucking insects
    - (c) Stages,—egg, larva, pupa, adult
    - (d) Kinds of insects and injury,—San Jose Scale, Codling Moth, Aphis, Borers
    - (e) Losses
  - (2) Controls diseases. S. pp. 163-174; G. pp. 75-91
    - (a) Fungus,—scab, rust.
    - (b) Bacterial,—fire blight.
  - (3) Essentials for successful spraying. S. pp. 204-205
    - (a) Know the pest for which spray is applied
    - (b) Know what to apply for the particular pest
    - (c) Apply spray at the proper time
    - (d) Apply spray thoroughly
    - (e) Let the wind help
  - (4) Kinds of spraying apparatus. S. pp. 175-188; G. pp. 94-100; W. pp. 87-92
    - (a) Pumps,—bucket hand pump, knapsack sprayer, barrel pump, double action hand pump, power sprayer, companies handling spraying pumps and advantages and disadvantages of different kinds of pumps
    - (b) Nozzle
    - (c) Hose

- (5) Spraying materials. S. pp. 189-200
  - (a) Commercial mixture vs. home made mixtures
  - (b) Kinds,—insecticides and fungicides. G. pp. 281-285
  - (c) Dry vs. liquid sprays; W. pp. 80-86
    - Insecticides as lime sulphur, kerosene emulsion, miscible oils, soap suds, tobacco extracts, Paris Green and arsenate of lead
    - Fungicides as bordeaux mixture, copper sulphate, and lime sulphur. W. pp. 77-79
- (6) Method of spraying
  - (a) Time,—kind of fruit, kind of insects, period of blossoming, and climatic conditions. W. p. 93-95
  - (b) Mixture,—kind of fruit and kind of injury
- (7) Dangers in spraying. S. pp. 201-210
- (8) Spray Calendars. (Green-Literature) Ia. Bul. No. 127
- (9) Home Orchard outfit
  - 1 good barrel pump
  - 1 double Vermovel nozzle
  - 1 Friend nozzle
  - 25 ft.  $\frac{1}{2}$ " hose
  - $\frac{1}{2}$  doz. extra hose clamps
  - 1 Bordeaux mixture nozzle
  - 5 50-gal. barrels
  - 4 pails
- h. Marketing. (Practical work to be arranged for fall work)
  - (1) Harvesting,—equipment, when to pick, method of picking and labor. S. pp. 229-244; G. pp. 102-104
  - (2) Grading. S. pp. 258-260
    - (a) Reasons for grading
    - (b) Grades and qualities,—extra fancy, fancy, grade C and culls
    - (c) Expense
  - (3) Packing. S. pp. 260-275
    - (a) Value of good packing
    - (b) Kinds of packages,—barrels, boxes, baskets, and cartons
    - (c) Methods of packing
    - (d) Pressing
  - (4) Storing. S. pp. 245-257; G. pp. 114-118
    - (a) Advantages
    - (b) Storage houses,—home and commercial
    - (c) Reasons for storing,—lengthen keeping period and prevents decomposition
    - (d) Keeping qualities of fruit
      - Handling
      - Degree of maturity
      - Delay in getting into storage
      - High temperature before storing
      - Fungous and other diseases
      - Conditions under which fruit is grown
      - Type of package used
      - Wrapping

- (5) Selling. S. pp. 277-286; G. pp. 105-107
  - (a) Direct to retail trade
  - (b) Wholesale trade
  - (c) Selling fruit on the trees
  - (d) Selling through commission men
  - (e) Coöperative marketing
  - (f) Factor of transportation
- i. Rejuvenating the old orchard. S. pp. 212-228; W. pp. 109-118
  - (1) Possible causes for nonbearing
    - (a) Old age
    - (b) Parasites
    - (c) Lack of care
    - (d) Depletion of soil fertility
  - (2) Steps in rejuvenation
    - (a) Removing old bark
    - (b) Cutting out diseased portions
    - (c) Thorough pruning
    - (d) Install and practice thorough system of spraying
    - (e) Begin orchard tillage
    - (f) Use cover crops
    - (g) Enrich the soil
- j. Small Fruits. Md. Bul. No. 182; Mich. Bul. No. 59
  - (1) The Strawberry. G. pp. 221-232; Wis. Bul. No. 248; Pur. Bul. 164
    - (a) Choosing adapted varieties
    - (b) Consider sexuality, providing for cross fertilization
    - (c) Selecting the site,—desirable soil and preparation of the soil
    - (d) Selecting strong plants,—pruning roots and tops and spring planting best
    - (e) Setting the plants
    - (f) Systems of planting,—hill, single hedge, Kellogg double hedge, Cook double hedge,—narrow and wide, matted row,—narrow and wide
    - (g) Care after planting
    - (h) Mulching
    - (i) Strawberry pests
    - (j) Methods and rules for picking
    - (k) Taking care of the crop
    - (l) Marketing
  - (2) Grapes. G. pp. 194-220; F. Bul. No. 471
    - (a) Adapted varieties
    - (b) Propagation—seedlings, cuttings, layers, grafting
    - (c) Choosing site
    - (d) Care and training of young vines
      - First pruning after planting,—summer pruning and winter pruning
      - Pruning bearing vines,—principles involved and objects of pruning
      - Training the vines,—the trellis system, Munson system, Kniffen system
      - Teach one good system
    - (e) Picking and marketing
    - (f) Grape diseases and insects

- (3) Currants. G. pp. 232-237
  - (a) Adaptable varieties
  - (b) Soils and planting
  - (c) Cuttings and layers
  - (d) Pruning
  - (e) Protection
  - (f) Mulching
  - (g) Picking and marketing
- (4) Raspberries. G. pp. 239-248
  - (a) Classes and varieties
  - (b) Propagation,—root cutting and layers
  - (c) Location
  - (d) Soil
  - (e) Planting—time and depth
  - (f) Pruning and thinning
  - (g) Winter protection
  - (h) Lifting canes in spring
  - (i) Harvesting
  - (j) Marketing
  - (k) Diseases
- (5) Peaches. G. pp. 183-190
- (6) Pears. G. pp. 171-175
- (7) Gooseberries. G. pp. 237-239
- (8) Plums. G. pp. 178-183

#### k. Propagation

- (1) Definition
- (2) Reasons for
- (3) Methods of
  - (a) By seed. G. p. 131  
Seed used for growing stocks to work on
  - (b) By offsets. G. p. 132  
Sprouts coming up from roots as in strawberry, raspberry, etc.  
Removed in autumn or spring with two or three inches of the root
  - (c) By layers. G. p. 133  
Laying down any portion of plant and covering,—Spring and Summer  
Mound layering,—Gooseberry and currant
  - (d) By cuttings. G. pp. 133-135  
Size  
Conditions necessary  
Planting  
Solar Pit
  - (e) Grafting. G. pp. 136-157; W. pp. 1-22  
Budding. Grafting while tree is growing. W. 8-12  
Time  
Method and condition for success  
Stock and scion healthy  
Buds should be well developed in axils  
Necessary implements  
Process  
Inserting  
June budding



- Grafting. W. pp. 12-22. Performed in spring when vegetation is dormant.  
 Wax  
 Factors in success  
 Cleft  
 Whip  
 Root  
 Side  
 Top working,—grafting or budding of tree after considerable size.

**References for Outline**

Title of Book	Symbol	Author	Publishers
Productive Orchardring	S	Fred Sears	Lippincott.
Popular Fruit Growing	G	Samuel B. Green	Webb Publishing Co.
Principles of Fruit Growing	B	L. H. Bailey 1915 Ed.	Macmillan Publishing Co.
American Apple Orchard	W	F. A. Waugh	Orange Judd.

**Wisconsin Experiment Station Bulletins**

- Wis. Bul. No. 201 Planting the Commercial Orchard  
 Wis. Bul. No. 207 Management of Bearing Orchard  
 Wis. Bul. No. 248 Strawberry Culture in Wisconsin  
 Circular No. 55 Apple Rust Can Be Controlled

**5. Special Reports By Pupils**

- a. Jack Frost and The Orchard.
- b. Fighting off a "freeze" in a big orchard
- c. Orchard maps
- d. Orchard irrigation
- e. Nursery inspection law
- f. United States Regulations
- g. Reports on fruits not included in general outline
- h. What trees shall I plant in my home orchard
- i. Wisconsin fruit districts—Door county, Kickapoo Valley, etc.

**6. Home Projects**

- a. Tilling orchard through summer and starting cover crop
- b. Planting and care of a plot of fruit such as:
  - One dozen apple trees Strawberry bed
  - One dozen cherry trees Currant and gooseberries
  - One dozen grape vines General fruit orchard
- c. Spraying and pruning of home orchard for a season
- d. Rejuvenating old fruit trees
- e. Laying out and setting part of orchard

**References for Farm Plant Life**

Textbooks for this semester's work are liable to be inadequate because of the large variety of subjects treated, namely crops, gardening, and fruits. We have no single text treating all of the subjects. Reference reading in books and bulletins must be provided.

Agricultural bulletins of your Experiment Station are probably the best reference material you can secure. William P. Stark Nursery Company of Stark City, Missouri has an excellent booklet entitled "Inside Facts of Profitable Fruit Growing" which they will furnish you with their catalog. This booklet will be valuable as a reference. Other commercial nurseries are usually willing and anxious to assist the agricultural teacher through literature, suggestion, material and in allowing classes to visit their plant. See Literature for reference and text material.

## POTATOES

It should be remembered in presenting a course in potato culture that local conditions of soil, climate, etc., may so influence the methods of culture as to make much textbook material on date of planting, time of plowing and other practices of little value. The teacher must make the necessary adjustments to suit the conditions of the community in which it is given.

### 1. Demonstrational and Laboratory Exercises

- a. Select show samples of at least one-half dozen Wisconsin varieties. Point out characteristics of each type.
- b. Give a mixture of several varieties of potatoes. Have pupils select the different varieties.
- c. Dig a potato plant with tubers attached. Point out characteristics of growth and development of tubers.
- d. Grow a few potatoes in very rich soil. Have pupils note results.
- e. To show effectiveness of corky tissue in preventing evaporation. Weigh two potatoes—one peeled—put aside for several days. Again weigh and note results. Appearance of decay may also be noted. What is use of this tissue to tuber? Name other products thus protected.
- f. A miscellaneous mixture of potatoes. Have pupils select three grades:—Fancy, 1st grade, culls.
- g. Field work in reference to plant diseases.
- h. Spraying demonstration in field. Mix spray materials and apply. Peel different varieties and determine in which there is least waste. Discuss economic importance of this.
- i. Visit a potato storage plant. Note methods of storage and handling.
- j. Cooking tests—baking tests. Select one-half dozen varieties and cook for certain period. Note condition. Which cooks quickest? Character of meal. Flavor?
- k. Experiment to determine relative merits of boiling and steaming.
- l. Mount potato tissue and have pupils note the starch grains. Make chemical tests for starch, sugar, fat protein, etc., in the potato.
- m. Dig 100 hills of potatoes in field where all the hills had as nearly uniform conditions as possible. Note the weight, uniformity, character and proportion of marketable tubers in each hill. Study the selection of seed. What would be the yield and value of an acre

of potatoes planted in the usual manner if all hills were like the best? If all were like poorest?

n. Go into a field of growing potatoes, put stakes beside hills on which foliage has been destroyed by bugs or blight and by hills with foliage uninjured. At digging time note yields from the marked hills. Results will emphasize the importance of spraying.

o. Secure samples of potatoes (tubers) affected with brown rot, dry rot and scab. Learn to identify.

p. Cut seed potatoes for planting. Treat for potato diseases.

q. School project with "hill to row" test.

r. Potato field trip to study insect pests.

s. Field trip to machine salesroom to study potato machinery.

t. Home project work with potatoes.

u. Scoring and judging of potatoes of various varieties.

## 2. Organization of Subject Matter

a. Local importance of the potato crop

(1) Yields, type, uses, diseases, etc. of the community

(2) The potato as a cash crop

(3) Experiences as to production, desirable rotation etc.

b. Potato varieties. F. chap. 7

(1) Choosing variety

(a) Quality and flavor. F. 72-74

(b) Yield. F. 74-76

(c) Disease resistance. F. 76

(d) Color. F. 76

(e) Nature of skin. F. 78

(f) Shape. F. 78

(g) Depth and number of eyes. F. 79

(h) Time of maturity. F. 79-80

(i) Tendency to make second growth. F. 85

(j) Vigor of variety. F. 82-84

(k) Cooking qualities and flavor

(2) Most Popular varieties. F. 87-90

(3) Varieties for Wisconsin and characteristics

See Wisconsin posters; also Wis. Bul. 225

(a) Early Rose

(b) Early Ohio

(c) Early Triumph

(d) Rural New Yorker (late)

(e) Carman No. 2 (late)

(f) Green Mountain (late)

(g) Sir Walter Raleigh (late)

(4) Groupings according to shape. Wis. Bul. 225, p. 7

(a) Round white

(b) Long white

(c) Rose group

(5) Studying potato score card of each variety. G. 311-319

(6) Judging of potato classes in each variety. Wis. Bul. 225, p. 20-22

(7) Improvement recommended in Wisconsin Bul. 225, p. 17-20

(a) Field selection

(b) Improved storage

(c) Community growing

- (8) Harvesting. F. Chap. 12; G. 111-119
- (a) Methods of digging
  - (b) Harvesting machinery. F. 144-146; G. 119-127
  - (c) Handling after digging—Hauling direct to market, G. 115; Piling in field, G. 147; Storing in cellar, G. 149
  - (d) Storage of potatoes. G. 149; G. 147-152; G. 127-141. Sorting and cellar,—Construction, ventilation and temperature, care of seed stock, loss in storage
  - (e) Yields and profits. G. 141-153
- c. The Selection of Potatoes
- (1) Judging potatoes
    - (a) Dealer's scale. G. 315
    - (b) Purchaser's scale. G. 315
    - (c) Consumer's scale. G. 315
  - (2) Market grades. G. 316-318
  - (3) Exhibiting potatoes. G. 311-314
- d. The Potato Plant
- (1) Structure of plant. G. 529-532; 521-522; F. chap. 1
  - (2) Structure of tuber. G. 522-525
    - (a) Nature of tuber
    - (b) Importance of eyes
  - (3) Conditions influencing growth
    - (a) Light. F. 8
    - (b) Moisture. F. 8-9
    - (c) Temperature. F. 9-10
    - (d) Depth of planting. F. 13-15
    - (e) Soil and cultivation
  - (4) Blossoming and fruit—Nature and occurrence. F. 16; G. 37-76
  - (5) Tuber formation, a perennial. F. 15
  - (6) Physical factors influencing the potato
    - (a) Soil. F. 17-25; G. 21-27; Wis. Bul. 225, p. 13-16; W. W. 426-428  
 Type of soils desirable and reason  
 Adaptability of soil to variety  
 Importance of mechanical condition  
 Importance of drainage  
 Adaptability of Wisconsin soils for potatoes
    - (b) Drainage. G. 28-36
    - (c) Fertility. F. 30-50
    - (d) Rotation. G. 88-89; F. 26-29
    - (e) Physical condition. G. 26-27
    - (f) Best soils and why. F. 17-18
    - (g) Fertilizers. F. 30-50  
 Object  
 Forms of commercial fertilizers, needs, influences and application
    - (h) Barnyard manure. F. 44-46
    - (i) Climatic range. G. 17-20
    - (j) Water requirements. F. 49
    - (k) Irrigation. G. 100-110
- e. Potato Marketing. F. chap. 14; G. 154-166
- (1) Problems of transportation. F. 153-156
  - (2) Hauling to market. F. 158-159

- (3) The middleman
  - (4) Factors influencing price. F. 157-158
  - (5) Importance of grading. F. 162
  - (6) Packages. F. 162-164
  - (7) Direct marketing. F. 160
  - (8) Purchaser's scale,—smoothness, paring, color of flesh, condition of interior
  - (9) Consumer's scale,—quickness and evenness of cooking, flavor, whiteness, mealiness.
- f. Diseases, Insect enemies and control. F. Bul. 544; W. 59-62; Wis. Cir. 52. See Wis. Poster on diseases of potatoes
- (1) Fungous diseases
    - (a) Early blight. G. 174-176; F. 112-117
    - (b) Late blight. G. 177-186; F. 118; B. P. I. Bul. 245
    - (c) Common scab. G. 186-190; F. 119-120
    - (d) Black leg
    - (e) Silver scurf
    - (f) Dry-rot. G. 193-195; F. 122; B. P. I. Bul. 55
  - (2) Physiological troubles
    - (a) Tip burn, leaf burn and scald. F. 11-112
    - (b) Hollow heart
    - (c) Black heart
  - (3) European diseases
    - (a) Black wart. G. 168-174
    - (b) Powdery scab.
  - (4) Insects. Wis. Cir. 52, p. 14-15
    - (a) White grub. G. 126
    - (b) Colorado beetle. G. 200; Dept. Ent. Cir. 83
    - (c) Flea beetle. F. 123-124; G. 202
  - (5) Sprays and spraying. Wis. Cir. 52, p. 16-20; F. 128-142
    - (a) Spray calendar. F. 179-180
    - (b) Bordeaux mixture. F. 128-130
    - (c) Dry Bordeaux. F. 130
    - (d) Washing soda and copper sulfate. F. 131
    - (e) Paris Green. F. 136
    - (f) Lead compounds. F. 137
    - (g) Arsenic compounds. F. 138
  - (6) Spraying machinery and application
    - (a) Cost of spraying. F. 140
    - (b) Profits. F. 139-140
    - (c) Number of sprayings, time of application and cost
- g. Growing the Crop
- (1) Seed. F. Bul. 533
    - (a) Selection and improvement. W. 37-44
    - (b) Source. F. 51-53
    - (c) Handling. F. 53-55
    - (d) Whole or cut seed. F. 60
    - (e) Size of seed. F. 61-63
    - (f) Amount per acre. F. 63-65
    - (g) Inspection and certification. W. 44-49; Wis. Bul. 252
    - (h) Value of seed plot. Wis. Bul. 225, p. 16

- (2) Planting. G. 81-94
  - (a) Date of planting. F. 96-97
  - (b) Distance apart. F. 91-93
  - (c) Depth. F. 93-94
  - (d) Methods. F. 97-104
- (3) Preparation of seed bed. G. 76-81
  - (a) Plowing. F. 21-23
  - (b) Surface fitting. F. 23-25
  - (c) Value of humus
  - (d) Importance of rotation
- (4) Management of growing crop
  - (a) Kind and amount of tillage. F. 105-106
  - (b) Methods of tillage. F. 106-107; W. W. 433-435; G. 95-100
  - (c) Object. F. 106; G. 94
  - (d) Implements. F. 107-110
- (5) Cost of growing potatoes and profits. G. 141-153
- h. The Potato as a food. F. Bul. 295; G. 7-16
  - (1) Chemical composition. F. 166-167
  - (2) Relative cost as food. G. 1
  - (3) Special value as food. G. 13-16
  - (4) Use as a stock food. G. chap. 25
    - (a) For horses. F. 168
    - (b) For cattle. F. 168
    - (c) For hogs. F. 168-169
    - (d) For sheep. F. 168
    - (e) For other animals
  - (5) Cooking potatoes. G. chap. 23; Texas. Bul. 350
    - (a) Effect on composition. F. 169
  - (6) Other uses of potatoes. G. 277-302
    - (a) Alcohol manufacture. F. Bul. 268
    - (b) Starch manufacture. Bul. Div. Chem. 58.—U. S. Dept. Agri.
    - (c) Potato flakes—dried
- i. History of Potato. Bul. 350 Texas; F. 1-7; G. 512-521
  - (1) Native of America
  - (2) Introduction into Europe—Ireland
  - (3) Importance in Europe—America G. 3-6
  - (4) Importance of potatoes in Wisconsin. Potatoes vs. corn
  - (5) Potato superstitions and prejudices. G. 309-321
  - (6) Importance of crop in Germany
- j. Production in U. S. and elsewhere. Bureau Statistics Bul. 62
  - (1) World production. G. 540-545; W. W. 424-426
  - (2) Production by different states. F. 154
  - (3) Acreage of different states
  - (4) Important potato producing states. G. 545
    - (a) New York
    - (b) Michigan
    - (c) Maine
    - (d) Wisconsin. G. 354-359
    - (e) Pennsylvania
  - (5) Average yields in different states. G. 542-545
  - (6) Average prices in different states. G. 542-545
- k. A Short Study of the Sweet Potato. W. W. 444-449; G. 241-254

References

G="The Potato"—E. H. Grubb and W. Gullford	} See main lists for publishers
F="The Potato"—S. Frazer	
W. W.="Field Crops"—Wilson & Warburton	
W.=Reports of Wis. Potato Growers' Association.	Prof. J. G. Milward,
Sec., College of Agriculture, Madison, Wis.	
F. Bul.=Farmers' Bulletin. U. S. Department of Agriculture.	
No. 35 Potato Culture	
91 Potato Diseases and Their Treatment	
295 Potatoes and Other Root Crops as Food	
407 Potato as a Truck Crop	
410 Potato Culls as Source of Industrial Alcohol	
Wisconsin Experiment Station Bulletin	
No. 256 The Marketing of Wisconsin Potatoes	
Circular 52 Control of Potato Diseases in Wisconsin	
Poster Bul. 1 Potato Diseases	
Poster Bul. 2 Plant Standard Potato Seed	

3. Home Projects with Potatoes

- (1) Planting, care and harvesting one-half to one acre of potatoes
- (2) Entire charge of at least one acre of potatoes which are inspected by the proper authorities and certified seed selected
- (3) Hill to row test with potatoes
- (4) Commercial fertilizer test with potatoes

ANIMAL HUSBANDRY

The work in Farm Plant Life and the first semester of Animal Husbandry may be offered to boys and girls. The third and fourth year work in agriculture should not be given to the girls.

A. General Outline of Animal Husbandry

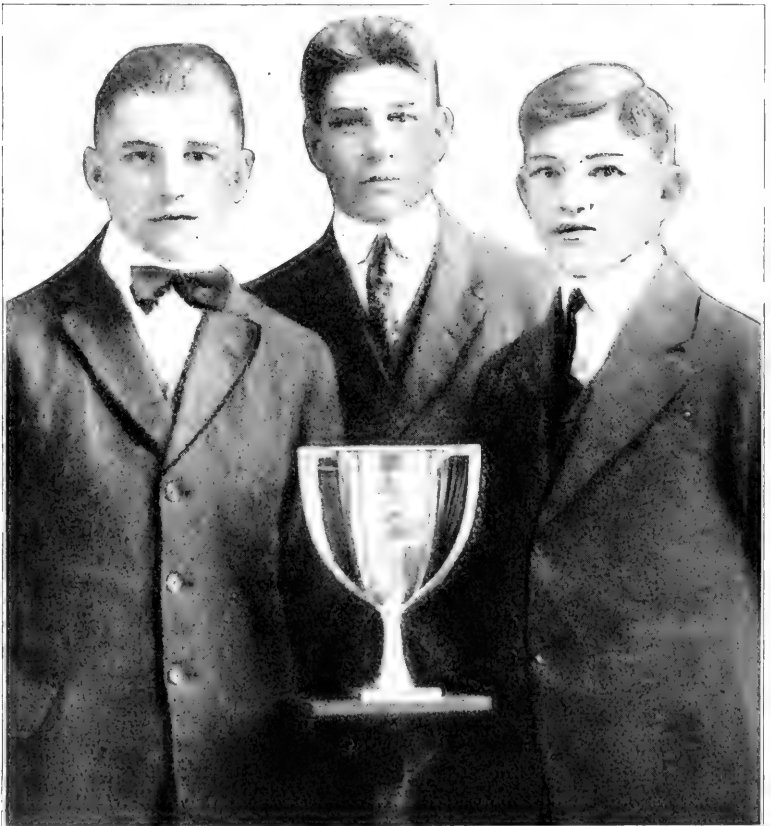
1. Second Semester—Second Year

a. Dairying

- (1) Composition and characteristics of milk, butter-fat testing of milk and its products, variations, adulterations, abnormal conditions, sediment tests
- (2) Bacteria:—sanitary milk production, pasteurization, solids and acidity of milk, milk separators
- (3) Butter and cheese making and tests for salt, moisture, etc., substitutes for butter and tests
- (4) Condensed and evaporated milk, ice cream, improvement of the dairy herd through milk and butter-fat records, diseases of cattle affecting milk production, coöperative creameries, creamery records, city milk supply, winter vs. summer dairying. Short study of dairy types, advanced registering standards of various breeds



WINNERS OF GARDEN CONTEST, WALDO. GIVEN A FREE TRIP TO STATE FAIR.



MILTON H. S. TEAM. WINNERS OF STATE STOCK JUDGING CONTEST HELD AT AGRICULTURE COLLEGE, MADISON, 1916. KRAUS, GRAY, HOLLIDAY.



- b. Feeds and Feeding of farm animals
- c. Poultry:—importance, meat, egg, general purpose types, house construction. Care and management, incubation, brooding, feeds and feeding for growth, eggs, flesh, products, health, diseases, enemies, storage, scoring, judging, breeding, marketing products
- d. Organization of Projects

## 2. First Semester—Third Year

- a. Types and breeds, characteristics, methods of development, care and management, feeding, pedigrees and their value, registration, barns and equipment, market, variations, diseases, breeding, care of young, defects, points of score cards and judging of horses, cattle, sheep, swine, etc., study of best local herds
- b. Dehorning, castration
- c. Simple veterinary practices and sanitation
- d. Fitting animals for show purposes
- e. Breeders' organizations, well-known breeders
- f. Live stock judging contests
- g. Home Project Work

## B. Typical Outlines of Topics

### DAIRYING

Dairying should be offered first and home projects in testing of herds developed. This will be the foundation of future work in farm management. Where this cow testing work has been made a year project for a herd the Wisconsin Dairyman's Association of Fort Atkinson has been willing to furnish a herd record book.

The production of better milk should receive more attention. A milk sediment tester is a valuable piece of apparatus. Arrange visits to the creamery, cheese factory or condensery. It is often possible for your boys to get practical experience in one of these and be given laboratory credit.

A small hand churn may be owned or borrowed and butter made a few times as a demonstration. Records of raw materials and products should be kept. Similar exercises may be conducted in the manufacturing of cheese. These same processes may later be observed at a commercial plant.

Some work with dairy cattle should be done in the spring but all intensive work in dairy cattle judging should be left until fall.

#### 1. Laboratory and Field Exercises

- a. Study of U. S. Dairy Division Records, survey of creameries, cheese factories in township, etc.
- b. Milk Study.
  - (1) Show fat, casein by souring, albumen by boiling, sugar by boiling clear whey

- (2) Butterfat test of ordinary milk. Test with weak and strong acid, surplus and small amount of acid, cold and warm acid or milk, use of hard or soft water and effect on test, reading with and without compasses, problems—interpretations, compare tests with test run at creamery, milk from representative breeds, colostrum milk
- (3) Butterfat test. Milk of stripper,—first milk and composite of two milkings same cow
- (4) Demonstration of preservatives showing that test is not changed
- (5) Calibration exercise,—Trowbridge, burette or fine balance
- (6) Hydrometer test of acid, specific gravity bottle test of water, alcohol and sulphuric acid
- (7) Test of milk for several days. Test on evening of cold storm, cow in heat
- (8) Test of partially churned sample
- (9) Test of milk already sour, several bottles sweet, test at intervals
- (10) Test of frozen milk
- (11) Begin milk sheet weighings at home, test composite samples and begin individual and cow test records for later use. This is home project work.
- (12) Test of cream, 9 and 18 gr. bottles, with and without fat saturated alcohol for reading, pipette vs. weight from cream with rich and thin cream—try out test when pipette is rinsed and without. Try two of each for check.
- (13) Test of skim milk, whey, buttermilk. Test out creamery and home separators
- (14) Place clean milk and dirty milk in warm place to sour. Use sterilized glassware. See which sours first. Notice curd with holes. Similar exercise of milk to sour in cold place. Be sure and sterilize glassware. Effect, dirt, etc., in each. Perform the milk sediment test for each patron at creamery, of each cow of a herd, city milk, etc.
- (15) Perform test for acidity—Mann's. Farrington's to check with Mann's
- (16) Get dry or wet starter from creamery. Secure clean milk in sterile mason jars and allow to sour and so get natural starter. Run both starters for several days. Test acidity and taste each day
- (17) Make a trip to creamery, cheese factory, condensery, sanitary or certified milk plant, city milk supply. Pasteurize milk for class in pail and compare rapidity of souring with same untreated
- (18) Find specific gravity of water, milk, acid, alcohol or gasoline. Show effect of temperature in same milk
- (19) Find total solids of a sample of milk. Skim it and find total solids, add water to some of original sample and repeat. Skim some of original sample and add water and repeat test

- (20) Draw conclusions. Prepare sample as in exercise 19 and have class determine conditions
  - (21) Detection of boracic acid by acidity test. Taste milk and compare with similar acidity. Test with formaldehyde
  - (22) Make sediment test of different classes of milk. Go to creamery or cheese factory for samples. Label. Get pictures of clarifiers or if possible visit condensery using one
  - (23) Study of separators at school, implement dealers, etc. If a separator is in school test out factors (under i) by experiment. Do major portion
- c. Butter
- (1) Make butter a few times illustrating over-run, ripening, etc. Make trip to local creamery or milk plant
  - (2) Test butter for moisture, salt, fat. Compare creamery vs. farm butter with these tests. Ditto oleomargarine with butter
  - (3) Study of butter score card and judging. Consult local creamery
  - (4) Substitutes for butter, boiling test, water house test
  - (5) Secure mottled butter
  - (6) Computation of factory records. See problem of Wisconsin Circular 27, "How to Use the Babcock Test," p. 27-30
- d. Study of local cheese factory
- (1) Make test for butterfat
  - (2) Study of butterfat vs. pooling system in creameries. F. W. 202-15
- e. Experiments according to importance in local community
- f. Problems as indicated in outline
- g. Beginning of cow testing problems
- (1) Have class keep records for a herd once a month. Have home projects for individuals
  - (2) Attend a sale of pure bred dairy cattle. Compare prices paid for A. R. O. cattle or progeny vs. untested

## 2. Organization of Subject Matter

### a. Wisconsin in Dairying

- (1) Production in cheese & butter vs. other states. Wis. Bul. 231 & 251
- (2) Leading dairy counties of state
- (3) Survey of pure bred cattle of district
- (4) Value of produce sold from local creamery or cheese factory
- (5) Methods of payment for milk, etc., by factory
- (6) Price per 100 lbs. for each month of one year

### b. Study of Milk

- (1) Six constituents and pounds per 100 lbs. milk, physical or chemical compound. V. 10-11; M. 123-130; F. W. 10-20
- (2) A complete food,—classify each constituent as food
- (3) Colostrum Milk,—characteristics, composition compared, function, value. M. 130-131

- (4) Secretion of milk. M. 131-134; V. 1-10 Ex.
- (a) Purpose
  - (b) Structure of udder and mammary vein system
  - (c) Factors controlling,—treatment, incomplete milking, etc.
  - (d) Duration of flow
- (5) Testing for butterfat. M. 135-145
- (a) History of the first tests,—inch of cream, oil churn test, etc. F. W. 173-205
  - (b) Importance of an accurate test, the Babcock test. F. W. 1-10
  - (c) Scientific basis for the Babcock test. M. 135
  - (d) Accuracy of the test dependent on what factors
  - (e) Method of test. M. 135-144; F. W. 29-72; Wis. Cir. 27, p. 1-4; F. W. 158-174  
Obtaining of sample, method, importance  
Composite samples, preservatives, samplers, preparation for test bottles. M. 135-137; F. W. 29-33  
Pipette,—method of handling, volume of milk, precautions. F. W. 29-33; F. W. 45-46  
Test bottles,—calibration and marking. F. W. 48-54; M. 137-142; F. W. 33-37  
Acid,—kind, quantity, quality, precautions in mixing, specific gravity, action. M. 137-142; F. W. 33-37; F. W. 46-48; F. W. 64-69  
Making the test,—time, care, rate, temperature, filling. M. 137-142; F. W. 33-37; F. W. 54-64  
Reading the test,—temperature, meniscus, colors. M. 137-142; F. W. 33-37  
Calculations in per cents and meaning of test. M. 142-144; Wis. Cir. 27, p. 14  
Precautions in testing,—causes of trouble. F. W. 69-71; M. 142-144  
Cleaning of glassware and racks. M. 144; F. W. 40-45  
Comparison of hand and steam testers  
Problems of three types
- (f) Causes for variation in butterfat test  
Breed characteristics. M. 132-134; M. 68-72; V. 12-19  
Stage of lactation period. M. 132-134; F. W. 140-145  
Changes of feed. M. 132-134; F. W. 151-157  
Unnatural conditions of excitement, storms. M. 132-134
  - (g) Sampling under special conditions  
Partially churned. F. W. 24-25  
Sour milk. F. W. 26-27  
Frozen, etc. F. W. 27
  - (h) Mathematical basis for calibration and volumes

- (6) Farm records for individuals and herds. M. 60-67. U. S. Dept. of Agric.—Bureau Animal Industry, Circular 179; Wis. Cir. 27, p. 14-20
  - (a) Construction of good milk scales, advantages over spring balance
  - (b) Month records as basis for butterfat and value of product
  - (c) Calculation of month's record on two milkings,—U. S. justification
  - (d) Feed records
  - (e) Profit or loss for month
  - (f) Start on work for year record of individual and herd
  - (g) Use as basis for profits on feeding rations
- (7) Adaptation of test and glassware for other products. F. W. 173-185; Wis. Cir. 27, p. 20-24
  - (a) Cream testing, types of bottles, weighing, reasons for, glymol, readings, amount of acid. M. 142-144; F. W. 76-87
  - (b) Tests of skim milk, whey or buttermilk, care required, acid. F. W. 88-99
  - (c) Problems
- (8) Care and handling of milk on the farm
  - (a) Souring of milk. M. 146-154; F. W. 135-137; V. 33-36
    - Causes
    - Sources of bacteria, favorable conditions for bacterial growth
    - The milk sediment tester,—its use, and value. Wis. Cir. 41
    - Types of bacteria,—useful and harmful, names
    - Acidity, causes, chemical action
      - Mann's Test for acidity, solutions and formula. M. 174-176; F. W. 117-134
      - Problems for solution. M. 174-176; F. W. 117-134
      - Farrington's test, solutions and comparisons. M. 174-176; F. W. 117-134
    - Commercial starters. M. 193-198
      - To make natural starter,—method and value
      - Kinds,—dry, wet, costs, value to butter-maker
      - Acidity of starter
  - (b) Abnormal fermentations in milk
    - Slimy, ropy, chromogenic, bitter, etc
  - (c) Flavors and odors in milk
    - Causes and examples
    - Relations to feed, milk-rooms, cellars, general care
    - Care to prevent taints, odors and flavors
  - (d) Sanitary milk production. M.155-164; M. 221-227; V. 61-69
    - Definition and importance
    - Healthy cows
    - Sanitary barn and clean yards

- Clean cows and clean milkers
- Clean and wholesome feed and water
- Clean, sanitary milk pails, strainers and cans
- Dry hand milking
- Clean bedding, air, and no flies
- Proper cooling and bottling. M. 205-211
- (e) Certified milk production. M. 236-238
  - Definition of term
  - Demand, cost and profits
  - Chicago certified milk standard
- (f) Pasteurization and sterilization. M. 284-286
  - Definition and methods. M. 263-268
  - Results and applications
- (g) Testing for milk solids and application. F. W. 100-115
  - Relative specific gravity of milk, water, sulphuric acid, etc.
  - Principle of lactometer test
  - Use of hydrometer in liquids lighter and heavier than water
  - Construction of Quevenne lactometer
  - Method of test and correction for temperature
  - Calculation of solids and interpretation of results
  - Application to city milk supply, adulterations, skimmings, etc.
  - Board of Health lactometer
  - Problems of interpretation
- (h) Detection of adulterations of milk
  - Boracic acid, formaldehyde, to keep milk. F. W. 247-250
  - Bicarbonate of soda to neutralize acid. F. W. 247-250
  - Dirt test in milk. See Wis. Cir. 41
  - Application to bacteria determination
  - Method of test
  - Use in factories and city milk trade
  - Use of clarifiers
- (i) Milk separators
  - Types, advantages, disadvantages, uses and efficiency of each. M, 165-167
  - Shallow pan
  - Deep setting
  - Dilution methods
  - Centrifugal separators. M. 166-170.
  - The Golden Stream. I. H. C., p. 57-63
  - Principles underlying operation
  - Kinds,—disks, hollow bowl, plates, makes, prices
  - Regulations,—milk or cream screw
  - Care of machine and operation
  - Factors of efficiency
    - Rate of inflow
    - Speed of bowl
    - Temperature of milk
    - Structure of bowl
    - Adjustments, etc.

Factors regulating richness of cream.  
V. 31, 32

Cream or skim milk screw adjustment

Relation of thickness of cream to efficiency

Speed of machine

Temperature

Value of a separator on farm. The Golden Stream—I. H. C., p. 57-59

Value in saving over other methods

Greater returns for skim milk in hogs and calves

Prevention of disease in clean herds

c. Butter

- (1) Ripening of Cream. M. 170-174; V. 37-42
  - (a) Object of ripening. Care of milk from time drawn until ripening  
Clean production without dirt, etc.  
Bacterial content and cleanliness of utensils  
Necessity of clean separator and cool product
  - (b) Effect on texture and flavor
  - (c) Method of using, making and holding starters
  - (d) Dairy vs. Creamery butter—the Why
- (2) Churning. M. 176-181; V. 43-50
  - (a) Types and advantages of different kinds of churns
  - (b) Temperature of ripened cream
  - (c) Care of churn: use and quantity of butter coloring
  - (d) Factors affecting churning, product, etc.
  - (e) Size of granules at end of churning
- (3) Finishing product. M. 181-185
  - (a) Washing: temperature of water, effect of washing, reasons for
  - (b) Salting: dry or wet and rate in each, advantages of each, purpose
  - (c) Working: importance, purpose, effect of over working, under working
- (4) Packing and marketing. V. 50-52
  - (a) Legal standard for moisture, test for moisture, method, variations. F. W. 231-236 and 251
  - (b) Kinds of moulds
  - (c) Prints, packages and tubs, sizes and advantages
  - (d) Retail and wholesale trade
  - (e) Limits for salt: test for salt, method, solution and calculations. F. W. 228-230
  - (f) Mottles: causes, injuries, how to prevent
  - (g) Over run in butter,—causes and legal standards. F. W. 189-198
- (5) Judging and scoring butter. V. 78-83
  - (a) Relative importance of points as shown by score card
  - (b) Practice in scoring, judging. Visit to local creamery discussed

- (6) Substitutes for butter. F. W. 236-240
  - (a) Manufacture of oleomargarine, test for by boiling, Waterhouse test
  - (b) Butterine, etc.
  - (c) Wisconsin laws concerning substitutes
- (7) Organization of coöperative creameries. Wis. Bul. 244
- (8) Special problems of the creameries
  - (a) Buttermilk cheese. Wis. Bul. 239
  - (b) Creamery sewage. Wis. Bul. 245
- d. Cheese. M. 187-192. Also M. 199-204
  - (1) Nature of cheese
    - (a) Value as a food
    - (b) Food elements contained compared with butter
    - (c) Milk best suited for cheese
    - (d) Kinds of cheese
  - (2) Study of apparatus and method of making American cheese
  - (3) Study and method of making Cottage cheese
  - (4) Causes of poor cheese
  - (5) Wisconsin curd test for purity of milk. F. W. 135-138
  - (6) Hart's Casein test—calculation on basis of casein and fat. Visit to cheese factory discussed. F. W. 198-200; F. W. 223-224
  - (7) Organization and construction of cheese factories. Wis. Bul. 244
  - (8) Markets and prices of Wisconsin cheese. Wis. Bul. 231-251
  - (9) Other problems of Wisconsin cheese work
    - (a) Buttermilk cheese. Wis. Bul. 239
    - (b) Whey butter. Wis. Bul. 246
  - (10) If in a cheese county a more intensive study would be followed, containing scoring, judging, salting, curing, marketing, etc.
- e. Other products from milk and cream
  - (1) Ice cream making (Michels—Dairy Farming Chap. 28, bulletins, etc.
  - (2) Sherbet
  - (3) Condensed and malted milk
  - (4) Evaporated milk
  - (5) Skim milk, buttermilk, Bulgarian, etc. M. Dairy Farming, Chap. 29
- f. Calculating Dividends by the Fat Test. F. W. 202-214; Wis. Cir. 27, Feb. 1914, p. 27-30
  - (1) Plan for calculating dividends in the beginning of dairy industry
  - (2) Unfairness of this plan
  - (3) Solution of problem typical of modern creamery. Cir. 27, Wis. Station, Feb., 1914
  - (4) Problems of same bulletin
  - (5) Problems in review of above and drill
- g. The Improvement of the Dairy Herd
  - (1) Present day conditions of the average Wisconsin farmer and local community. M. 9-11; M. 11-17
    - (a) Average production per cow in milk and butterfat in pounds
    - (b) Type and breed of general community



- (c) The sire: his care and his calves. Breed of sire
- (d) Building and equipment
- (e) Feeds and feeding
- (f) Business management and records, etc.
- (g) Markets
- (2) Records as indicators for herd improvement—  
Wis. Cir. 27, p. 14-20. The Golden Stream I. H. C.—41
  - (a) Milk record and scales. M. 60-65
    - Types of scales and cost
    - Convenience of use
    - Regularity of use
    - Facts shown by scales
      - Production
      - Feed returns
      - Abnormal conditions
  - (b) Testing for butterfat. (Scales records considered) M. 65-68
    - Testing as basis for selection
    - Testing as basis for computing profits,—individuals, herd
    - Conditions shown at end of year by records
    - Cow testing associations of Wisconsin, of Denmark. Cir. 179 Bureau of An. Industry
    - Consideration of local conditions
  - (c) Study of Wisconsin herd records. Hoard's Dairyman
- (3) Grading as step towards better herds. M. 17-18-24
  - (a) Definition and theory of value of grading
  - (b) Methods and results obtained
  - (c) What constitutes a good sire: breeding, conformation, health
  - (d) Place and extent to which grading should be used
  - (e) Place and use for records in grading
  - (f) The future of the dairy industry: knowing our calves
- (4) Estimation of values of dairy stock. Dairy Farming—Michels, Chap. 32
  - (a) Factors: grade or pure bred, value of products, calf, manure, labor, buildings, interest, market, etc.
  - (b) Value of 175, 300, 400, 500 pounds butterfat cows
  - (c) Value of sires
  - (d) Value of calves
  - (e) What can average farmer afford to pay for sire (pure bred)
  - (f) Value of one good female to herd

This outline of subject matter is suggested as teachable in the order given. It has been taught in this order. It may be elaborated or cut in many particulars to meet conditions locally.

**Reference for Dairy Outline**

- M=Michels—Dairy Farming  
 V=Van Norman—First Lessons in Dairying  
 F W=Farrington & Woll—Testing Milk

**3. Home Projects for Dairying**

- a. Perform 7 day or 30 day test on one or more dairy animals, following all steps as in official testing.
- b. Perform the yearly semi-official test for three or more cows.
- c. Keep cow testing, feed and milk record for one year.
- d. Clean and whitewash home dairy and put in shape to make a good score
- e. One week's work in cheese factory, creamery or condensery.

**POULTRY**

**1. General Suggestions.** A course in poultry is adapted to almost any high school, either in the city or country. Unlike other courses in animal husbandry, it does not require a large outlay of money to purchase stock for the class work, and the expense for other equipment is not large. In localities where dairying is not important the poultry course may be given a full semester. The city high schools are doing some work but it deserves a place in the rural high school. Six weeks may well be spent in the rural high school and perhaps even twice that amount. Other advantages of a poultry course are that it is adapted to both boys and girls and it is a great field for home project work.

Poultry has been neglected in most high schools and the study of cattle, horses, etc., has been called animal husbandry. No class of live stock is so well adapted for school work. Poultry may be used at a time when the weather prevents the use of cattle, horses, etc. We have excellent opportunities for demonstrating feeding for growth, fattening or for a cash product of eggs.

A large number of types of pure-bred chickens are always found in every community and poultry fanciers will assist and loan birds for demonstration purposes. The poultry show is becoming a common event and junior poultry associations are being organized. Incubation, brooding, feeding, caponizing, marketing of eggs and fowl are all interesting and enlightening subjects for school work.

Poultry may easily be provided as property of the school. The sale of produce will make it a profitable venture.

**2. Laboratory and Field Work**

- a. Demonstration of anatomy of chicken.
- b. Arrange for study of the three general types of poultry as regards general characteristics of body.
- c. Visit available poultry farms and study various breeds.
- d. Building of poultry house,—Under supervision of teacher, boy students start building of a miniature colony house 3' x 3'. L. 181;

R. ch. X; Cornell Cir. 14; Wis. Bul. 215. House to be built with one side left open. Should have nests, roosts, feed receptacle and ventilation.

e. Utility Classification,—Visit poultry farms observing as many different breeds as possible.

f. Visit poultry houses that need repair and suggest how same may meet requirements of good arranged house.

g. Structure of egg. Get as many different kinds of eggs as possible. as regards fertility and condition; demonstrate candling eggs before the class. Classes of eggs as to color, size, quality.

h. Preserve eggs in water glass (silicate of soda).

i. Demonstration. Take two fresh eggs from the same flock. Smear wet poultry yard dirt on one; leave the other clean. Set them away in a fairly warm place for about four days. Bring out and examine first with tester then break.

j. Start an incubator of eggs. Demonstrate regulation of thermostat and difference in temperature in different parts of the egg chamber. Keep students in touch with care, handling and manipulation during the entire hatch. Have them note in particular changes in eggs as incubation increases.

k. Brooding. Remove chicks in proper time to the brooder. Demonstrate effect on temperature of different amounts of litter in the brooder. Also show difference in temperature of different parts of the brooder.

l. Arrange to spray poultry houses for parasites. Preparation of dust mixture and operation.

m. Construction of various articles of equipment for poultry house.

n. General construction of several types of trap nests.

o. Demonstration of the method of caponizing if thought desirable.

p. Demonstrate crate fattening of general poultry, capons, etc.

q. Demonstration of ways chickens are killed, dressed, etc., for market.

r. Practice exercises in scoring according to the descriptions of "The Standard of Perfection."

s. Use half a dozen hens, using ordinary and balanced rations. If the school owns poultry this might be a school project.

t. Poultry clubs.

### 3. Organization of Poultry Subject Matter

a. Poultry Raising in U. S. F. B. 200; L. p. 324-331; P. p. 7-35

(1) Importance of the industry. R. p. 24-25

(2) Evolution of the poultry industry. P. p. 12-23

(3) A successful poultry keeper, characteristics, problems. R. p. 64-69

(4) Branches of poultry culture. R. p. 30-40

(5) Attractiveness of the industry

(6) Purposes of poultry raising

(a) As a part of the farm stock. R. p. 35-40

(b) As a special business

(c) As fancy poultry

(7) Special poultry districts. R. p. 40-43

- b. Poultry Products. L. p. 272-300
- (1) Food products
    - (a) Eggs. L. 273; R. 325; O. 118, p. 84  
 Gathering and care of on the farm. F. B. 287, p. 41  
 Testing for fancy trade  
 Sorting and packing. L. 296 & 285; R. 325-327  
 Methods of selling L. 294-296; F. B. 405, p. 19; F. B. 287, p. 40; R. 329, to consumer, retailer, commission men, and through creamery, R. 331; R. 335; F. B. 445  
 Study of season prices  
 Shipping methods. L. 298
    - (b) Market poultry (L. 275-287; F. B. 355, p. 35-39; R. 324-333; P. 390-93) as broilers, roasting chickens, fowls, capons, shipping live poultry and picking and shipping dressed poultry. R. 311-321
  - (2) Special products
    - (a) Pedigree poultry. L. 91
    - (b) Hatching eggs. L. 279, 290
    - (c) Day old chicks. L. 279, 290
    - (d) Feathers. L. 280; R. 324; R. 334
    - (e) Manure. L. 280
- c. Hatching and Rearing of Chicks
- (1) Function of the egg and of incubation. L. 94; R. 238
  - (2) Formation of the egg. L. 98
  - (3) Structure of the egg. R. 238; L. 94
  - (4) Breeding and mating. L. 84-93
  - (5) The fertile egg. R. 239; L. 103; F. B. 405, p. 18
    - (a) Selection of breeding stock
    - (b) Selection of hatching eggs (R. 245; L. 106, 192, and 333; F. B. 287, p. 28), normal and abnormal eggs, trap nesting and egg records. (P. 453-473)
  - (6) Natural incubation
    - (a) Selection of the hen. R. 243; L. 112
    - (b) Nests for sitting hens. L. 113; R. 245-248
    - (c) Setting and management of hens. L. 114; R. 243; R. 246; F. B. 287, p. 29
    - (d) Testing the eggs. R. 248; L. 116
    - (e) Hatching of eggs (R. 251-2; L. 117) and helping birds out of shell. R. 252
  - (7) Artificial incubation. F. B. 355, p. 23
    - (a) Selection of the incubator. R. 254; L. 122; F. B. 287, p. 30
    - (b) Management of incubator
      - Placing of incubator. L. 122
      - Regulation of heat. R. 258; L. 125. Care of lamp. L. 126
      - Regulation of moisture. R. 260
      - Regulation of ventilation. R. 260
      - Cooling eggs. L. 128
      - Turning eggs. L. 128
      - Testing eggs
      - Management during hatching. R. 263

- (c) Causes of poor hatches. R. 264; L. 130
- (d) Incubator records. L. 130
- (8) Brooding. L. 133-143; F. B. 287, p. 30
  - (a) Importance of warmth. R. 275
  - (b) Brooding temperatures. R. 280
  - (c) Construction of artificial brooders. L. 133
    - Cold brooders. R. 277
    - Lamp heated brooders. R. 278
    - Pipe brooders. R. 279
  - (d) Operation of brooder. L. 136; F. B. 355, p. 26
  - (e) Protection from enemies and parasites. R. 282-283
  - (f) Rate of growth. R. 284
  - (g) Weaning.
  - (h) Rations. L. 139
  - (i) Things to be avoided in brooding. L. 140
- (9) Care after weaning (L. 143-149; R. 282), importance of warmth, large and free range, green feed and shade. Protection from enemies.
- (10) Caponizing
  - (a) Advantages of caponizing. P. 390-392
  - (b) Market requirements. P. 392
  - (c) Age for caponizing. P. 393
  - (d) Instruments. P. 393
  - (e) Method of operation. P. 393-400
  - (f) Results. P. 400-401
- (11) Breeding for improvements
  - (a) Types of improvements, egg, meat, form. P. 252-264
  - (b) Principles of poultry breeding (Difficult). P. 221-245
  - (c) Breeding systems. P. 246-252
  - (d) Management of breeding stock. P. 281-290
- d. Utility Classification of Poultry. Discuss as to size and external appearance, disposition, maturity, broodiness, hardiness, feeding, production and color of eggs. L. 48-51
  - (1) Egg breeds. L. 48; R. 352; F. B. 287, p. 5
    - (a) Leghorn. L. 52; R. 355-362; F. B. 51, p. 19
    - (b) Minorca. L. 53; R. 363; F. B. 51, p. 23
    - (c) Ancona. L. 55; F. B. 51, p. 27
    - (d) Campine. L. 55; R. 370
    - (e) Houdan. L. 58; R. 382; F. B. 51, p. 34
  - (2) Meat breeds. F. B. 287, p. 6
    - (a) Brahmas. L. 62; R. 391; F. B. 51, p. 12
    - (b) Langshans. L. 64; R. 390; F. B. 51, p. 17
    - (c) Cochins. L. 64; R. 387; F. B. 51, p. 15
    - (d) Cornish Game. L. 66; F. B. 51, p. 39
  - (3) General Utility breeds. F. B. 287, p. 6; L. 68-72
    - (a) Plymouth Rocks. L. 72; R. 398; F. B. 51, p. 6
    - (b) Rhode Island Reds. L. 73; R. 413; F. B. 51, p. 11
    - (c) Wyandottes. L. 74; R. 406; F. B. 51, p. 8
    - (d) Orpingtons. L. 74; R. 416; F. B. 51, p. 28
    - (e) Dorkings. L. 74; R. 378; F. B. 51, p. 27
  - (4) Miscellaneous breeds. L. 77-83

- e. Study of poultry feeds
- (1) Carbohydrate feeds. L. 226-230; R. 184-197
  - (2) Feeds for fat as meat scrap (20% fat), sunflower seeds and linseed meal. R. 193
  - (3) Feeds containing ash for egg shell as wheat bran, dried bone (R. 199; R. 203), oyster shell. R. 203
  - (4) Succulent feeds as clover, lawn clippings, rape, millet, oats, buckwheat, soybeans, and swiss chard. R. 195
- f. Digestion.
- (1) Study of digestive tract. L. 219; R. 172
    - (a) Mouth parts. R. 172; L. 219
    - (b) Gizzard. L. 219
    - (c) Crop. L. 220
    - (d) Stomach
    - (e) Pancreas
    - (f) Intestines
  - (2) Work performed by organs in digestive tracts
  - (3) Assimilation and nutrition. L. 221
- g. Study of rations for poultry. R. 206-237
- (1) Droppings as indications of right feeds. F. B. 287, p. 26
- h. Feeding young chickens. L. 243; F. B. 287, p. 31
- (1) Ill effects of feeding day old chicks
  - (2) The growing period
    - (a) Rations for growing period. L. 139
- i. Feeding for egg production. L. 251; F. B. 355, p. 35
- (1) Feeding for maintenance
  - (2) Feeding egg producing food
  - (3) Other influences on egg production
    - (a) When laying begins. R. 289; F. B. 287, p. 27; F. B. 255, p. 32
    - (b) Causes of retarded laying. R. 291
    - (c) Conditions of egg production. R. 293
    - (d) Duration of laying period. R. 297
    - (e) Molting. R. 298; F. B. 287, p. 26
    - (f) Influence of male on production. R. 494
- j. Feeding for market
- (1) Market classes (L. 263) as broilers (F. B. 287, p. 34-35), roasters, fowls, and capons
  - (2) Principles
    - (a) Restriction of exercise
    - (b) Rich carbohydrate and fat ration
    - (c) Protein in abundance
    - (d) Moist feeding
    - (e) Maintenance of a good appetite
  - (3) Rations for fattening. L. 268
  - (4) Crate and cramming fattening. F. B. 287, p. 37
- k. Poultry Housing. L. 153-210. Location of houses. L. 152-155; W. 4; F. B. 287, p. 7; F. B. 355, p. 21
- (1) Prime considerations in shelters are fresh air, sunlight, dryness, and room. R. 104; L. 162-4
  - (2) Coops. R. 104
  - (3) Tight houses. R. 108
  - (4) Importance of ventilation. R. 112; L. 165
  - (5) Open front houses. R. 114. See pictures, R. 131-154; C. 14
    - (a) Floor dimensions. R. 115; L. 166; W. 11; F. B. 287, p. 9

- (b) Height. R. 118
- (c) Depth. R. 118; W. 12
- (d) Length of houses. R. 119
- (e) Standard size unit for houses. R. 119
- (f) Styles of roof. R. 121; L. 199; W. 12
- (g) Walls. R. 125; W. 16; W. 19
- (h) Floors. R. 125; W. 15
- (i) Materials. R. 126; L. 200; W. 18
- (j) Windows of wood, glass, cloth, cement. F. B. 287, p. 9
- (6) Colony houses for chicks. L. 147; F. B. 287, p. 17
- (7) Interior arrangements of houses
  - (a) Roosts. R. 156; L. 189; W. 19  
Roost room per hen depends on breeds. R. 156; F. B. 287, p. 10  
Material. R. 157  
Dropping boards. R. 158; L. 173; L. 189; W. 21
  - (b) Nests. R. 160; L. 191; W. 22; F. B. 287, p. 10  
Requirements for different kinds of poultry  
Size of boxes for nests  
Position of nests. R. 161  
Number of nests required. R. 163  
Trap nests. R. 162; L. 192
  - (c) Feed troughs. R. 163; F. B. 287, p. 11
  - (d) Feed hoppers. R. 165; C. 14, p. 17
  - (e) Drinking fountains. R. 166; W. 24; F. B. 287, p. 11
  - (f) Dusting boxes. R. 167; W. 25; F. B. 287, p. 11
- (8) Equipment (R. 167-171; L. 158; F. B. 287, p. 12) as to tools, feed mixers, bone cutters, root cutters, egg testers and fences
- l. Judging and Scoring of Poultry. L. 349-350
  - (1) The score card
    - (a) "American Standard of Perfection" gives score cards and points for each breed
    - (b) Study of the points of a fowl
  - (2) Comparative judging and scoring of all breeds available (This may be elaborated according to the community).
  - (3) Preparing of birds for exhibiting and exhibits. P. 477-496
- m. Poultry Diseases and Enemies. F. B. 287, p. 43; L. 301-324
  - (1) Causes of disease are internal defects of organs, improper feeding or surroundings and contagious diseases. F. B. 287, p. 43; L. 301-324
  - (2) General Symptoms of disease. R. 337, 339; F. B. 287, p. 43
    - (a) Special symptoms. R. 340
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  - (3) Description of common diseases as roup, chicken pox, canker, liver affections, indigestion and diarrhoea, prolapsus, bumble foot, frozen combs, tuberculosis, and cholera. L. 310-15; F. B. 287, p. 43

- (4) Parasites as gapeworm, lice, red mites, tape-worm, depluming mites, scaly leg mites. F. B. 355, p. 23; R. 341; L. 317-20
- (5) Enemies as rats, weasels, minks, skunks, hawks and crows, and thieves. L. 321-22
- (6) Sanitation as a preventive of diseases. L. 301
  - (a) Clean homes. L. 302
  - (b) Care of droppings. L. 303
  - (c) Disinfectants. L. 304
- n. Poultry Club Work. L. 8-11  
(See Outline put out by Boys' and Girls' Club Work, College of Agriculture, Madison, Wisconsin.)
- o. Study of Turkeys, Ducks, Geese, etc., as desired

#### References for Poultry Outline

- P—Productive Poultry Husbandry—Lewis
- L—Poultry Keeping—Harry L. Lewis
- R—Principles and practices of Poultry Culture
- W—Wisconsin Bulletin No. 215
- O—Ohio Circular
- C—Cornell Circular
- F. B.—Farmers' Bulletins, U. S. Department of Agriculture
  - 287—Poultry Management
  - 445—Marketing Eggs Through the Creamery
  - 51—Standard Varieties of Chickens
  - 405—Marketing of Eggs
  - 64—Ducks and Geese
  - 182—Poultry as Food
  - 355—A Successful Poultry and Dairy Farm
  - 206—Turkeys

#### 4. Home Project for Poultry

- a. Remodel home poultry house
- b. Purchase setting of eggs from some pure bred breeder and raise chicks for school fair.
- c. Start home project on egg production. Let pupils try different types of balanced rations.
- d. Feed and egg record for flock for six months.
- e. Fattening crate of young chickens.
- f. Operation of incubator and brooder.
- g. Comparison of gains of six capons with six other chickens that are being fattened.
- h. Preparing pure bred poultry for poultry show.

#### C. Score Cards and Judging

Animal Husbandry probably makes an appeal to more students than any other agricultural subject. The scoring of animals is the phase most often attempted first and in most instances results in failure. The method of instruction is the same as found in college classes and as a result the ground covered is beyond the comprehension of the high school boy. The teacher fails to comprehend the purpose and value of score card study and it is taught in a way which gives it little educational value. The process is merely one of guessing instead of one involving thought and is a hindrance rather than of an aid in learning the meaning of type. We need to spend more time on methods of presentation of our subject.



The beginner in live stock judging must necessarily acquire a knowledge of type. The process of scoring animals, grains, etc. to determine a per cent of the perfect type probably has a place and value for college classes but has little place in secondary work. The student must learn the peculiar structural form of the various classes of grains and live stock. The score card value of the points is the necessary thing to consider for it is more important for the student to know that 10 points are given for length of the ear of corn and 5 points for a good tip, than to have him perform the mechanical routine of scoring a sample. In other words we want the student to know that the expert places greater stress on the matter of length than on the importance of a good tip with loss in length, and we want him to appreciate the reason for this apportionment of values. We then want to give the student an opportunity to apply this in comparative judging. The score card is valuable in as much as through its numerical values it emphasizes the importance of certain structural forms.

The farmer through experience has recognized that certain structural form is essential for his favorite breed. He may be as good or better judge than the college man who understands the score card. Both through different avenues have learned the same thing. Our score card shows the relative importance of these structural forms as experience and scientific study have determined and in a score card we can quickly bring these facts to the attention of the student. Again different breeds have ideals toward which they are working and so the score card for Guernsey type has some different points and also different values for the common points than those found for the Holstein score card. The chief value then of the score card is in teaching the location and the value of the various parts of the animal.

In using the score card with animals, etc., it is important that the student have in mind the points. For instance, in the consideration of the body of a draft horse the pupil must know that he must consider the chest, ribs, back, loins and underline. He must also know the limitations of the back and why we want it of certain structural form. Place the emphasis on this study of the score card and drill until pupils know the ideal type and can give intelligent reasons in comparing animals. Such a study of the score card of the draft horse will probably take several days but when the pupil has accomplished this and realizes the numerical value for the parts he is ready to begin comparative work. A large amount of drill will be necessary before he will master this phase of the work. The boy will probably want to know why 8 points are given for the fore feet of a horse and 6 for the hind. Here is the problem for study and the chance to get real value from the score card. Study the score to find what points are emphasized and so need particular study. In all this preliminary study use the best type horse available as ideals are being formed.

After the score card is understood, the next step is comparative judging. Take two horses and make a comparative study of smaller points such as action, pasterns, back; etc. This will lead to selecting the better forequarters, head and neck, and finally in selecting the better horse. In working this way more time is required but the student will know type and will have ideals. Teach students to look for points of major importance in selecting animals, such as quality, action, feet and hocks, etc. of a horse and not those of minor importance such as ears, eyes, forehead. Minor points at times assist but are usually not the determining ones. The pupil will then be prepared for stock judging contests.

Samples of Wisconsin Score Cards are given in the appendix. Samples of score cards and sometimes literature and pictures for the various breeds of live stock may be obtained of the secretaries of the different National Registry Associations. A list of the same is given in the appendix.

#### **D. Live Stock Judging Contests**

The live stock judging contest held at Madison, Feb. 10-12, 1916, was a great success. In choosing the team for this contest districts used different systems of marking some of which proved unsatisfactory. The following plan for district contests is a modified form of one used in some districts last year and gave entire satisfaction.

Four animals shall constitute a class. It is unsatisfactory to have classes of two or three animals and classes of five or more give so many possible placing combinations that proper grading becomes prolonged and difficult. The individuals of the class shall be designated by a card on each animal. These cards shall be lettered so that each class shall have a different set of symbols. This is the plan adopted in the national contest in judging dairy cattle.

In the state contest there were two classes of draft horses, two of swine and two of dairy cattle. It is planned that two classes of beef cattle and perhaps two of mutton sheep will be added this year.

The team from each school may be chosen by individual competition over a period of one, two, four or more weeks of judging or according to class records. Individual competition according to a modified plan similar to that used in the district contest is probably preferable.

When teams have been selected to represent the schools the agricultural instructors shall decide the place of meeting for the district contest. A large stock farm, asylum farm or community where plenty of good live stock is available should be selected. If possible secure live stock with which contestants are unfamiliar.

When contestants and instructors meet for the district contest,



STATE STOCK JUDGING CONTEST HELD AT STATE AGRICULTURAL COLLEGE, MADISON, FEBRUARY, 1916. WON BY MILTON HIGH SCHOOL TEAM COWS, HORSES AND PIGS WERE JUDGED.

choose three agricultural instructors as the judging committee and select one or more of the remaining instructors as the managing committee to take charge of the boys' papers, and see that there is no communication between contestants and see that general satisfaction is given. Some districts have arranged for a county representative or some prominent stockman to judge the classes. This is a better plan if the county representative or selected judge is a stockman who can give satisfaction. It is impossible for the College of Agriculture to send competent judges to all district contests. Such being the case the plan most common will be where the high school instructors act as judges.

It shall be the duty of the judging committee to select the classes and decide the official placing of each class. They should do this before contestants have placed the class or work at the same time. However, it would be preferable to have them do this before the contestants have completed their placings. The judges will keep notes for future reference on reasons for the placing of each class. When the judging committee has decided the placing of a class, its decision shall be given to the managing committee.

In selecting the places it is advisable that one judge be appointed clerk and vote be made by ballot for first place. In case the majority do not agree the judges shall complete work, discuss the reasons and rebalot. A similar method may be followed for other places. It is inadvisable, however, to choose exceedingly difficult classes because if judges are unable to agree, the high school contestants can not be expected to agree. Select animals showing considerable difference in type. After contestants have placed the class, the judges shall discuss the class and give reasons for placing.

Every contestant shall be given a number by the managing committee by which he shall be designated throughout the contest. Judges shall not know the numbers of contestants. When a class is brought into the ring a placing card such as the following will be furnished each contestant. Such cards will be furnished by the state committee.

STOCK JUDGING PLACING CARD

Class..... Sec.....

No. ....

Placings (1)..... (2)..... (3)..... (4).....

Reasons for No.....over No.....

1. ....
2. ....
3. ....
4. ....

Reasons for No.....over No.....

1. ....
2. ....
3. ....
4. ....

Reasons for No.....over No.....

1. ....
2. ....
3. ....
4. ....

THIRTY minutes will be allowed for each class of dairy cows and draft horses and TWENTY minutes for each class of swine.

No conversing allowed.

Hand papers to the man in charge before leaving the judging ring.

Twenty to thirty minutes shall be given for placings and reasons, as decided by managing committee. The managing committee shall see that the contestants do not communicate with other contestants, spectators, judges, etc. Any one doing so shall be disqualified. Contestants shall be notified three minutes before

time is up and when final time is called by the managing committee, the placing cards shall be collected by the managing committee.

When all classes have been placed the managing and judging committees shall get together for marking reasons and to determine final rankings. The managing committee shall check up on the placings according to the following plan. One hundred points will be allowed the contestant for a correct placing as determined by the judges. Variations in placings may be marked as follows. This illustrates all possible combination of four animals when the correct placing of animals is A, B, C, D.

#### Percentage Plan on Placings

A B C D	100	B A C D	85	C A B D	65	D A B C	35
A B D C	90	B A D C	75	C A D B	45	D A C B	20
A D B C	80	B C A D	70	C B A D	42	D B A C	15
A D C B	60	B C D A	55	C B D A	30	D B C A	10
A C B D	87	B D A C	50	C D A B	30	D C A B	5
A C D B	78	B D C A	30	C D B A	12	D C B A	0

The following illustrates the method of rating: The animals are lettered A, B, C, D and the judges decide that B, D, C, A is correct placing. A contestant placing them thus receives 100. Another contestant placed them B, C, D, A. He has transposed the second and third places i. e. 1, 3, 2, 4 corresponding to A, C, B, D of our percentage plan on placings, giving him 87. Others as follows.

Card Placing	Order	Key	Percentage
B D C A (correct)	1 2 3 4	A B C D	100
C B D A	3 1 2 4	C A B D	65
A D C B	4 2 3 1	D B C A	10
B A D C	1 4 2 3	A D B C	80
D C B A	2 3 1 4	B C A D	70

When the managing committee has marked contestants on placing, one of the managing committee shall read all reasons to the judging committee on placing of one class. The judges are not to know the number or name on the paper. Each judge by referring to his notes may decide the merits of the reason given. On a ballot he shall mark his percentage. These shall be pinned to the placing card and the average of the three ratings be given as the ranking on reason. Thus if the judges ranked a paper 50, 90, and 70 the percentage on reasons for that class would be  $(50+90+70) \div 3 = 70\%$ . The judges in this way will not know numbers or names of contestant who wrote paper and will mark solely on merits. Reasons will be marked for each class separately, for instance all of one class of dairy cattle, then the next, one of horses, the next, etc.

In the state contest 30% was given on reasons and 70% on placings.<sup>1</sup> When reasons and placings are completed they shall be com-

<sup>1</sup>Changed in 1917, to 40% on reasons and 60% on placings.

piled as follows for each team. This is the record of the winning team at the state contest.

STATE CONTEST RECORD

	Contestant No. 8		Contestant No. 1		Contestant No. 15	
	Place	Reasons	Place	Reasons	Place	Reasons
Dairy Cattle No. 1.....	78	83	78	85	45	81
Dairy Cattle No. 2.....	60	72	60	90	80	88
Swine No. 1.....	90	85	80	60	60	70
Swine No. 2.....	87	75	55	65	55	82
Horses No. 1.....	100	87	100	85	100	88
Horses No. 2.....	85	83	85	85	85	85
Totals.....	500	485	453	470	425	494

70% Placings .....	350 (No. 8)	320.6 (No. 1)	297.5 (No. 15)
30% Reasons .....	145.5 (No. 8)	141 (No. 1)	148.2 (No. 15)
Final Mark .....	495.5 (No. 8)	461.6 (No. 1)	445.7 (No. 15)
Team Mark .....	1402.8		

The team with the highest total is awarded first place. The individual with the highest total is awarded first as individual contestant. It is suggested that all percentages, rankings according to placings and all computations be checked by the judging committee before an announcement is made. Send all placing cards with judges' placings and attached ballots on reasons to the state committee in charge so the report may be filed as evidence of the right of the winning team to compete.

SOILS

**A. General Suggestions.** A knowledge of a few of the fundamentals of chemistry will assist in the study of soils. If chemistry is not offered in the course the teacher should spend some time in reviewing elements, bases, acids, salts, and simple chemical reactions as studied in general science. Soils work of a technical nature such as determination of phosphates in a soil is not adapted to secondary work but demonstrational exercises such as solubility of fertilizers, formation of acid phosphates from rock phosphate, determination of the capacities of soils for moisture, heat, etc., and a study of soil types of the community and their management may be more readily understood by the pupil and will permit of more practical application.

Provision should be made for a supply of air dry soils and sub-soils of the community. Where troubles are found in growing of crops, samples of the soil should be collected and accurate descriptions of troubles recorded. A study of these is the most profitable type of classroom work in soils. Such cases give excellent opportunities for home project work.

Each school should secure a set of the soil survey bulletins of the state. If your community has been surveyed secure samples of the soil types mapped and teach pupils to read the maps and teach the management of each soil type. State Soils Survey, Agricultural College, Madison.

A study of soils must deal with plants but this must be from the standpoint of their interdependence, the types best adapted to various crops and the preparation of soils so as to be most productive. The work should emphasize the physics rather than the chemistry of soils. The following is suggestive of a semester's work.

### **B. Soils and Soil Fertility—Second Semester—Third Year**

Relations of soil, land, and plant growth  
 Soil formation, composition, types and properties  
 Properties, care of and fertilizing values of farm manure  
 Commercial fertilizers, types, value, mixing, application  
 Water supply, movements, availability and conservation  
 Temperature of soils  
 Drainage, types, costs and efficiency  
 Practice in mapping, ditching and laying tile  
 Management of important types of soil  
 Soil tillage, methods, rotations, machinery  
 Green manuring, fallowing, humus  
 Acidity of soil and liming  
 Legumes and their relation to soil fertility  
 Interpretation of soil survey maps  
 Plant diseases  
 Forest problems  
 Landscaping  
 Silos and silage  
 Interdependence of plant and animal life

**C. Suggestive Outlines.** Drainage is selected as a subject of importance to most communities and is outlined in a suggestive way. It will not necessarily be taught in the order outlined. This will be decided by availability of practical work, community needs and the experience of pupils. A survey to show the importance of this subject to the community, visits to drained and undrained areas, a study of the productivity of land drained, etc. will give a basis for a better understanding of its many problems.

#### **1. Demonstrational and Laboratory Exercises**

- a. Study of root systems of plants where water levels are different.
- b. Determine water capacity of sand, loam, muck, clay and all types of soils in community. Begin with fine air dry soils and use equal volumes.



c. Show that muck soil heats rapidly when moist and result when water soaked. Test temperatures of drained and undrained soils of same exposure to sun.

d. Show that equal volumes of water and soil heat and cool differently.

e. Study points of greatest moisture for instance at foot of hill vs. a short distance beyond. Explain.

f. Study tools used in drainage.

g. Determining differences in elevation of places. Find fall per mile of a stream.

h. Pupils make plane-table map of a field or several fields.

i. Design a simple system of drainage.

j. Computation as to cost of a drainage system.

k. Practice in laying tile and drainage of a small area if possible.

## 2. Organization of Subject Matter on Land Drainage

a. Drainage as a local problem

(1) Areas drained

(a) Value before drainage

(b) Present value

(c) Cost of drainage

(2) Undrained areas

(a) Present valuation

(b) Suggestions as to methods of drainage

b. Land which could be improved by drainage

(1) Area of such land in home community. Soil Survey maps

(2) Area of such land in the state. J-3

(3) Area of such land in U. S. W. W.-188

(4) Kinds of land. J-23-25; L. F.-239; E-14-15

(a) Flat land with highlands around

(b) Tight level clays. Wis. Bul. No. 202-5-10

(c) Potholes

(d) Swales or sloughs

(e) Bench marshes

(f) Large backwater marshes. Wis. Bul. No. 205-4-6

c. Kinds of soil moisture. E. pp. 1-7; A. pp. 47-52

(1) Gravitational—harmful to plants

(2) Capillary—useful to plants

(3) Purposes of drainage is removal of harmful water

(4) Source or cause of excess water must be considered in determining type of drain

(a) Too much precipitation on given area for natural drainage to carry off

(b) Seepage from surrounding upland

d. Types of drains. E. p. 7; J. pp. 5-23

(1) Surface—accomplished by open ditches and surface runs

(2) Underdrainage—accomplished by tile and to slight extent by open ditches

(3) Vertical drains

(4) Dykes for retaining surface water from upland surrounding drained area

(5) Pumping system in connection with dyke

- e. Advantages of Drainage. J-3-4; E-20-21; L. F. 239-41; W. W.-188
- (1) More water available to plants. W. W.-189; L. F.-241; E-21
    - (a) Deeper roots developed through lower water table preventing drought and making available food supply
    - (b) Free water injurious to plants is removed by drainage
  - (2) Higher temperature in drained soils. W. W.-189; E-21; L. F.-242
  - (3) Earlier cultivation possible. L. F.-240; E-20
  - (4) Ventilates soil giving roots chance to develop and air for soil bacteria. L. F.-242; W. W.-189
  - (5) Lessens crop failure due to excessive rains in spring.
  - (6) Reduces erosion. L. F.-247
  - (7) Convenience. W. W.-190
  - (8) Reduces moisture of soil and consequent heaving of plants by freezing. L. F.-245
  - (9) Improves structure of soil. L. F.-240; E-17
  - (10) Removes injurious salts from alkali soils, and poisonous organic compounds. L. F.-247
  - (11) Promotes sanitary conditions of community. E.-21
  - (12) Prevents frosts. E.-21
- f. Surveying, designing and building drainage systems
- (1) Field work preliminary to designing system. A. 55-61
    - (a) Land areas: rectangular sub-division, mapping, sketch and computation of areas
    - (b) Slopes and leveling: elevation, contour line, profile, grade line—required gradient, and grade notes
    - (c) Instrument work—leveling: establish outlet; determine most difficult point to drain; locate depressions or valleys; stratification of soil aids drainage; and record all surveys on map and level notes. E. 23-43
  - (2) Types of drainage systems. A. 63-66
    - (a) Removal of surface water. L. F. 248-50; E. 23-7; W. W.-190; J.-7; J.-14
      1. Surface runs: dead furrows, sodded runs, size
      2. Diking at foot of highland, to keep water off lowland
    - (b) Removal of soil water. W. W.-191
      1. Deep open ditch: ordinary ditch and capstam ditch. J-19-21
  - (3) Tile Drainage
    - (a) Outlet of tile system—usually ditch or stream
    - (b) Principles in locating tile
      1. Place main in line of natural drainage  
Surface flow of water in that direction  
Stratification aids underdrainage

2. Run in straight lines as far as possible
  3. Sub-main follow natural line of slope as much as possible
  4. In general the laterals should be run in direction of greatest fall  
May be necessary to lay laterals to intercept seepage water
  5. Avoid short laterals wherever a system with long laterals can be used—less double drainage
  6. Locate lines so that all of area can be drained
- (c) Systems of drains: natural, herringbone, gridiron, grouping, double main, Elkington. A. 66-68
- (d) Depth of drains is determined by nature of soil and thoroughness and rapidity of drainage desired E. 48; A. p. 68; B. pp. 160-175
1. Clay soil in general shallowest.  $2\frac{1}{2}'$
  2. Muck and peat below frost line. 3'
  3. Sand medium depth
  4. If necessary to cut off seepage water, place deeper
- (e) Frequency of drains is determined by efficiency and economy required. A. 70
1. In dense clays generally place four rods apart. In other soils usually farther apart
  2. This is, however, a problem necessary to determine from nature of area to be drained
- (f) Size of tile, especially main. A. 53-57; B. 130-145; J. p. 11
1. Size of area that main drains
  2. Nature of that area, particularly if it has springy subsoil
  3. Position or shape of area
  4. Height of surrounding upland
  5. Degree of slope
- (g) Staking out the lines. A. 70
1. Determine stations
  2. Designate system in orderly manner for mapping
  3. Establish grade stakes and lath to guide in laying tile
- (h) Location of ditches. A. 183-186
1. Establish grade  
Uniform as possible  
May be as low as 6"-12" per mile
  2. Depth of ditches  
Make deep enough for thorough drainage
  3. Compute size and capacity of ditches by Elliott's formula
  4. Construction of ditch

5. Types of ditching machines
  - Floating dipper dredge
  - Traction dipper
  - Other types
- (i) Practice of laying tile
  1. Grade determined by lath
  2. Excavating trenches and smoothing bottom
  3. Laying tile
  4. Curves and junctions
    - Smooth, regular and gradual
    - Make angles at junctions acute—never right angles
    - Step off
  5. Protect outlets
    - Sewer pipe or plank box
    - Screen
  6. Auxiliary surface runs
  7. May be necessary to use silt basins
    - Marked change of velocity from rapid to slow
    - For purpose of emptying large number of submains into one point on main
  8. Covering tile
    - Blinding by hand
    - Cover with team
- (j) Computation of cost. J. 10-11; E. 121-131
  1. Cost of labor
  2. Cost of tile
    - Kinds of tile,—clay, concrete, wood
  3. Cost per acre
- (4) Comparison of open ditch, tile drainage, efficiency, capacity, convenience, cost and maintenance
  - Vertical drains. Used mostly for potholes. J. 21-22
- g. Increased production from drainage to pay for system. E. 132-8
  - (1) Time to be considered
- h. Large systems. J. 33-37; E. 139-144
  - (1) Coöperative enterprises
  - (2) Legal aspects. J. 14-19
  - (3) Use of machine ditchers. J. 48-49
- i. Special drainage
  - (1) Highway
    - (a) Importance to good roads
    - (b) Means of securing
  - (2) Farm premises. Barnyards and cellars

#### References used in Drainage Outline

- A—Elliot—Engineering for Land Drainage  
 B—French—Farm Drainage  
 J—Wisconsin Bulletin No. 229—The Right Drain in the Right Place  
 E—Elliott—Practical Farm Drainage  
 WW—Whitson and Walster—Soil and Soil Fertility  
 LF—Lyon and Fippin—Soils

**3. Special Reports by Pupils**

- a. Drainage systems of Holland
- b. Ditching for the Panama Canal
- c. Drainage districts of Wisconsin and your county
- d. The drainage laws of Wisconsin

**4. Home projects for soils**

- a. Leveling and planning a drainage system and assistance in installation
- b. Fertilizer tests with crops, compare manure with commercial fertilizers, etc.
- c. Production of corn crop on marsh soil where it has been a failure due to lack of phosphorus and potassium or other causes as determined through study
- d. Liming and inoculation of soil for an acre of alfalfa
- e. Pot test with soils to determine limiting elements
- f. Field plot tests of soil to determine fertilizing elements needed
- g. Fight for a season to rid farm of noxious weeds, area determined by weed and by extent of distribution
- h. Care of farm manure for season to conserve all liquid manure and prevent leaching

**FARM MECHANICS**

**A. General suggestions.** This work should include a study of buildings, equipment, machinery, and the various conveniences and labor saving devices which contribute not only to the financial success of farming but to the comfort, health and enjoyment of the home. It is highly important that boys in this course should gain an intelligent command of such problems, as the construction, use and repair of the most modern farm machinery, the planning and construction of the best buildings, the construction and repair of good roads, the installing and use of the best farm conveniences and the providing of the most sanitary conditions about the home. This study is valuable not only because of its practical value on the farm, but also because it furnishes the most interesting and valuable applications of the principles of physics, which often have all too little interest to farm boys. Two phases of work should be emphasized although these two need not be separated in any arbitrary way. There should be regular and systematic instruction covering the topics outlined below.

About the only suitable text for this work is Davidson's Agricultural Engineering. This book should be supplemented by the use of a good deal of reference material. See list of literature under "Farm Mechanics."

Along with this instruction work should be carried a large amount of practical or project work in the construction of farm buildings and concrete work and in the installing and operation of the best equipment. Some suggestions for this work have already been made under Manual Training for the fourth year. That work



SCHOOL BARN BUILT BY AGRICULTURE CLASSES AT GREEN BAY,  
WEST SIDE HIGH SCHOOL.



CEMENT BLOCK SHOP BUILT BY AGRICULTURE CLASS AT MON-  
DOVI HIGH SCHOOL.

should be made a part of this plan and considered as the laboratory side of the work. Even in schools giving the special manual training course, the manual training side should be very closely correlated with this work in Farm Mechanics.

### B. Outline of Farm Mechanics

Agricultural surveying: measurement and sub-divisions of land, U. S. public land survey, instruments, map making, etc.  
 Laying out the homestead: space for lawn and landscape planting, drives, location of buildings, garden, home orchard, etc.  
 Arrangement, design and construction of homes and farm buildings  
 Study of plans and blue prints, types of construction, materials, cost, emphasize dairy barns, barn equipment  
 Labor saving devices of the home  
 Conveniences and sanitation: heating, lighting, ventilation, water supply, sewage disposal. Send to State Board of Health for literature  
 Construction, operation and efficiency of steam and gas engines, tractors, etc.  
 Construction and operation of automobiles  
 Concrete Construction: silos, water tanks, side walks, troughs, fence posts  
 Farm Machinery. See special outlines  
 Ventilation of farm buildings: King system  
 Roads: Importance, construction, machinery, the road drag, bridges and laws, state control  
 Rope and belt work  
 Practical bench and forge work related to farm building and concrete construction

### C. Special Suggestions on Treatment of Topics

**1. Construction work.** For list of tools and other materials needed see lists under equipment. For further suggestions see outline and suggestions under fourth year manual training. If previous work outlined under manual training has not been done, some work should be carried on here in mechanical drawing, making and reading of working drawings, and in working out some woodworking projects such as step ladders, gates, wagon boxes, trap nests, etc. See outlines, suggestions and references under manual training. See especially Brace and Mayne—Farm Shop Work and Roehl—Agricultural Woodworking. See literature lists.

**2. Special helps.** The best place to study farm machinery will be with the local dealer in farm implements. Make arrangements for pupils to help in setting up different types of machinery. This has been done by many schools with excellent results. Study differences of construction and consider common troubles. For instance have pupils regulate corn planters for checking, drilling, differences in distance between rows, etc. Test out seeders and drills. Note and compare improvements on different makes of machines. Have a definite outline to follow and avoid waste of time.

Arrange to get a gas engine for study at school. In a number

of schools old engines which have been abandoned have been secured and pupils have taken the project of repairing and getting such a machine to running. Make comparative studies of different types found in the community following some definite outline in the study of each engine. In many schools the gas engine used in the basement for pumping water or running a motor may be used for special study.

In the study of plows plan a plowing demonstration and arrange a plowing contest for some Saturday. Such contests arouse unusual interest. If there are tractors in the community these should receive special study and a contest in plowing by tractors might be arranged. The operation of all types of machinery should be emphasized. A mere bookish description of machines and dry descriptions of what they are used for has little value.

Visit well-equipped farms in the community for the study of machinery and buildings. Don't miss the demonstration farms about the state.

Collect catalogs and other literature relating to machinery, buildings and building equipment. See list of "Miscellaneous Helps" under "Equipment," such as James barn equipment, J. I. Case threshers and tractors, Deere & Co., plows and tractors, and the I. H. C. general farm machinery. Collect, study and compare advertisements of automobiles. See that the best along every line of equipment is brought before the pupils in a visual way as far as possible. Use the bulletin board for the display of pictures or illustrative material of special interest.

Write for material from the State Board of Health, Madison, on sanitary conditions of the home.

**D. Special Exercises.** The following exercises are typical of the kinds that may be worked out:

**1. Construction of Engines**

- a. Names of engines, manufacturers and where manufactured
- b. Types of engines
- c. Rated H. P. and R. P. M.
- d. System of ignition used
- e. Kind and location of carburetor
- f. System of cooling used
- g. Take engine apart, noting the number and relative position of piston rings and provision to keep the joints from getting all in the same straight line

The engine must be completely set up and by aid of the instructor timed and wired. Study several makes. Tear down and set up.

**2. Battery study.** Make a thorough study of the construction of a dry cell that is worn out. Diagram horizontal and vertical sections of the same.



Select a partially worn out cell and a new cell and carefully measure the amperage and voltage of each by means of the voltmeter and ammeter. Punch holes in the weak cell and place it in a vessel of water for 24 hours and test again. Take all readings quickly and keep records of each.

Arrange cells in series and test. Arrange same number of cells in multiple and test. How does voltage, amperage and resistance compare in each case and also with that of the cells separately?

Study the construction of a primary induction coil and explain its action.

### 3. Jump Spark Ignition

- a. Introduce the coil in a circuit of six cells in series and test for voltage and amperage and notice length of spark jump
- b. Place the cells in multiples and repeat
- c. Place the six cells in multiple series and repeat
- d. Put spark plug in circuit and repeat a, b and c
- e. Try the effect of moisture oil and dirt on the points of the spark plug
- f. Draw diagrams of a, b, c and d

### 4. Wiring

- a. Wire up a number of single cylinder engines with make and break ignition
- b. Repeat a for jump spark. Diagram the methods of wiring

### 5. Gas Engine Troubles

The engines will be put in some usual trouble by the instructor and the students will be required to put them in running order and write a report of the trouble and their means of remedying it.

### 6. Construction of Plows (Gang and Sulky)

- a. Name of plow and place of manufacture
- b. Size of bottom
- c. Beam or frame hitch
- d. High or low lift
- e. Hand or foot lift
- f. Method of guiding
- g. Style of landside, (high, low, long, short or medium)
- h. Is landside necessary
- i. Is beam in line with plow bottom? If not, why not
- j. How are front and rear furrow wheels attached and for what purpose
- k. What is purpose of coulter, and weed hook
- l. Remove bottom
- m. With aid of instructor determine amount of land and wing suction
- n. Number of pieces in plow bottom
- o. How reinforced

### 7. Harrows

- a. Smothing Harrows
  - (1) Name of harrow and where manufactured
  - (2) No. and width of sections

- (3) Shape, length and number of teeth. Distance apart. How fastened
- (4) Kind of frame
- (5) Are sections
- (6) Can teeth be thrown at various angles
- b. Disc Harrow
  - (1) Name and place of manufacture
  - (2) Style: full disc, cut away, spade or spike
  - (3) No. of discs to a section. Space between and how cleaned
  - (4) Diameter of disc. Is large or small disc preferable
  - (5) Are there wheels for transporting disc
  - (6) Where would you use the four styles of discs

### 8. Cultivators

- a. Name of cultivator and place of manufacture
- b. Tongue or tongueless, riding and walking or both
- c. Single or double row
- d. Disc or shovel and number of same
- e. Is there a leveler behind shovels? Why is one desirable
- f. Hand or team lift
- g. Wheels: kind, height, width
- h. What effect will the variation of the height of hitch have on penetration of the cultivator? Is it desirable to cultivate deep

### 9. Fanning Mill

- a. Name and place of manufacture
- b. Does mill clean, grade and separate grain? If so, how many grades
- c. Is separation according to size or weight of kernel
- d. Which way do sieves move
- e. What was the R. P. M. of the handle
- f. Compute the R. P. M. of the fan
- g. Place a bushel of uncleaned oats in the hopper and clean by use of the oat sieve. Find % of seed grain; % of small and light grain, and % of weed seed and dirt. Report for barley and wheat

**h. Problem.** If a seeding of 3 bushels of good seed oats will give a yield of 40 bushels per acre, granting that the small and light grain and seed and dirt will not yield, what would be the loss in bushels on a 40 acre field of oats if you sowed oats similar to those you cleaned?

### 10. Grain Drills

- a. Name and place of manufacture
- b. Width
- c. Number of horses
- d. Furrow openers,—kind, number. Give advantages and disadvantages of each
- e. How is grain conveyed from seed box to ground
- f. If discs are used to open soil, are they in line or not? Why
- g. How do you regulate amount of seed sown
- h. How are discs or shoes held in ground
- i. Has drill a seed attachment
- j. Where and when would you use a seeder in preference to a drill

**11. Corn Planters**

- a. Name of planter and where manufactured
- b. Kind, size and width of wheel
- c. May distance between wheels be changed? What is present width
- d. Kind of furrow opener
- e. How is depth of shoe regulated
- f. Vertical or horizontal fork and how is wire held within
- g. How is planter changed for drilling
- h. How is the number of kernels per hill regulated
- i. Block up the machine and fill boxes with corn, put machine in gear and turn wheels until you have 100 drops. Keep record number of kernels each time and take the average. Repeat for several different sets of plates. Remove the tips and butts of ears and use the uniform corn for one series of tests and for the second series use corn taken from all parts of the cob and compare the accuracy of drop.

**12. Manure Spreaders**

- a. Name and where manufactured
- b. Type of apron. (Advantage and disadvantage of each)
- c. Can apron be tightened? How tight should it be run
- d. Does apron start at same time as beater? Why
- e. How is beater driven
- f. If machine has a rake, what is its use
- g. Find capacity of box in cubic feet and bushels
- h. Which is preferable, steel or wood wheels? High or low wheels
- i. How is the number of loads per acre regulated
- j. Should a machine be thrown in gear while the team is moving
- k. How should the spreader be loaded? Rear or front first

**13. Binders (Grain)**

- a. Name and place of manufacture
- b. Width of cut
- c. Open or closed elevator
- d. Is there a provision for slackening the elevator
- e. Why is a serrated section used on a binder and not for the mower
- f. Number of reel slots and arms
- g. How would you place the reel to catch grain that was leaning away from the platform? Toward the platform? Straight
- h. What is the purpose of the retarder on the platform
- i. Kind of butt adjuster. Can it be adjusted from the driver's seat
- j. Can the binder part be shifted? Which way would you throw it for tall grain? Short grain
- k. Loosen and tighten the knotter belt noting the effect in each case on the knot
- l. Do the same with the twine disc and note effect
- m. Does knife move toward twine or remain stationary
- n. If binder were missing continuously where would you look for the trouble and what would you do
- o. Practice threading the binder from box to needle
- p. Would you oil the chains a little or at all
- q. Which way should a chain be run

- r. What are some of the brands of twine and the prices of each
- s. Can size and tighteners of the bundles be varied? How? In what case would you make small bundles? Large? Which is more economical on twine used
- t. Where would you place the tilting lever on the quadrant when on the level? Going up hill? Down hill

#### 14. Road Work

The road work will cover a period of about one week and will consist of assigned reading and actual observation of road work and machinery. It is intended that this work be given about the latter part of May when road work is in progress.

- a. Benefit derived from good roads
- b. Sources of revenue for road improvement
- c. Some practical systems of road management

### FARM MANAGEMENT

The study of farm management is perhaps the most difficult of the agricultural subjects. In this work comes a casting-up of accounts on the various activities of the farm. The work should treat of local conditions and not a study of tables compiled in other states. A single entry system of bookkeeping or some other simple plan of accounts should be taught. An analysis of the good and bad in farms of the community will make the work practical and valuable.

Practically all of the agricultural work has dealt with the labor of the farmer. In farm management an opportunity is given for a study of the problems of the home, its conveniences, labor saving devices, social life and pleasures. This phase of farm management and a study of advancement along these lines are vital for the future of the rural community.

#### A. General Outline of Farm Management—Second Semester— Fourth Year.

- Development of American agriculture
- Business forms, notes, receipts, bills, contracts, etc.
- Practical farm bookkeeping; farm records, farm inventory
- Types of farming and results, special advantages of stock farming
- Cost production of crops, animals, etc.
- Pure bred vs. grade or scrub live stock and seed
- Mapping the farm: The farmstead, apportionment of crops; pasture, woodlot, etc.
- Systems of crop rotation, remapping the farm
- Farm and home conveniences
- Farmers' organizations: granges, live stock, breeders and pure seed associations
- Agricultural extension services, county representatives
- Factors affecting farm profits
  - Management of soil, live stock, machinery and labor
  - Choosing a farm

- Study of farm home, social life, rural school trade centers, etc.
- Special rural problems: Coöperative buying and marketing, rural credits, etc.
- Surveys of local farms or projects

## B. Treatment of Topics

In the study of the various topics of the following outline it is probably best to use several farms of the community as models for study in the light of the reference readings. For instance, in the mapping of a farm all might work with one farm and make a study of the same. When this is completed each may make the same type study of the home farm or an assigned farm and report as a special topic. Each may make inventories, study of rotations and finally the remapping. This will give an opportunity to study the home farm and make plans for the improvement in operation.

### 1. Laboratory and Field Exercises

- a. The Farmstead—Mapping and replanning of home farmstead. Maps to be blue printed
- b. Replanning of buildings, on home farm, making of blue prints of plans of new buildings and improvements
- c. Mapping of farm  
Making of blue print map of home farm
- d. Types of Farming—Visits to different farms
- e. Rotations—Planning of rotations to fit farm plans
- f. Remapping of own farm and transition plans
- g. Management of Live Stock  
Keeping of milk and feed records and the testing of milk
- h. Farm bookkeeping and farm inventory work
- i. Feed and milk records
- j. Farm records for the year and second inventory

### 2. Organization of Subject Matter

- a. Farm Planning
  - (1) The Farmstead. Illinois Cir. 17—"Illinois Way of Beautifying Farm": Boss, F. M. p. 71; Warren, F. M., p. 394-401; Boss, F. M. p. 67-70; Warren F. M., p. 389; Minn. Bul. 125: Warren, p. 388; Boss, p. 64-78; Minn. Bul. 125: Farmers', Bulletin. No. 185. Beautifying the Home Grounds.
    - (a) The grounds: attention given to laying out of lawns, the banking of shrubbery, the location of trees, the matter of roadways, walks, etc.  
Gardens and flowers
    - (b) The buildings as to: location with respect to roadways, location with respect to each other, location with respect to sanitation, location with respect to artistic appearance, size of buildings for different enterprises, and internal arrangement to promote saving of labor and space
    - (c) Location of the farmstead: shall be such as to promote economy in getting to and from fields, shall be such as to minimize as much as possible social isolation

- (d) The size of the farmstead: shall be in proportion to size of farm, is often determined by the farm business
- (2) The Mapping of the Farm. Boss, p. 79-90; Watten p. 365-402; Minn. Bul. 125, p. 50-96
- The methods of making maps, pacing off the dimensions of fields, designating contour of fields, crops on them, location of buildings, lanes, trees, low places, roadways, etc. The gathering of necessary data, number of animals kept, future plans of the owner, kind of soil, number of soils, drainage conditions, acreages, etc.
- (3) Types of Farming. Boss, p. 43-51; Warren, p. 43-182; Minn. Bul. 125, p. 18; Bailey's Cyclopedia of Agriculture. See index
- Study of types of farms classified according to the enterprises carried on: vegetable, fruit, crop, mixed stock and crop, live stock and dairy
- Study to be according to requirements, advantages, disadvantages, incomes, relation to soil fertility, relation to labor question and capital needed.
- 4) Systems of Crop Rotation. Minn. Bul. 125; Bailey's Cyc. of Ag.; Wilson & Warburton, p. 503-521; Boss, p. 92-101; Bailey's Cyc. of Ag., Vol. 2, p. 92-109
- (a) Advantages of rotation.
- Increase of soil fertility
  - Reduction of expense of labor
  - Better distribution of labor throughout the year
  - An increase in quantity and quality of products
  - Better control of crop diseases and pests
- (b) Disadvantages of no rotation
- Prevents any business organization of farm enterprises
  - Makes the farm operations too variable from year to year
- (c) The rotation plans
- Treatment of rotations best adapted to the types of farming taken up in (3)
  - Rotations adapted to varying kinds of soil
- (d) The relation of crop rotations to farm organization and planning
- (5) The Remapping of the Farm. Bailey's Cyc. of Ag., Vol. II, p. 90-109; Warren, Farm Man. p. 365-416; Boss, Farm Man., p. 79-102; p. 152-167; U. S. Bul. 236; B. P. I. Minn. Bul. 125
- (a) Points to be considered
1. The adaptation of the plan to the kind of farming that is to be pursued
  2. The best utilization of the different soils and the exposures and natural features of the place
  3. The economizing of the time and labor spent in reaching all parts of the place
  4. The best location of buildings with reference to efficiency of administration
  5. Such layout as will best provide for rotation of crops and the maintenance of soil fertility
  6. A proper proportion between the different parts, as between tilled and untilled land, forest and open, meadow and pasture, forage crops and grazing, and orchards and annual crops

7. Provision for the necessary live stock
  8. Such shape and size of fields as will best lend themselves to economical working
  9. Provision for the more personal parts of the place as gardens, yards and ornamental features
  10. The development of the artistic or attractive appearance of the entire farm
- (b) Problems of transition period
1. Adjustments to secure proper rotation
  2. Economy in fencing to be considered
  3. Adjustment of plan so as to make use of present seeding

The aim in remapping a farm is not to make a plan that necessarily can be carried out in a few years but to provide a plan toward which all changes and improvements made on the farm can be directed so that in the end every farm will some day have a layout that is ideal.

b. Farm Operations

- (1) Management of Soil. Bailey's Cyc. of Ag.; any good text on soils; U. S. Bul. 192; Hart's Ag. Chem., p. 221; Boss, p. 123-139; Bailey's Cyc. of Ag.; Warren, p. 183-202; p. 402-415; Boss, p. 92-101; Wilson & Warburton, p. 503-521; Minn. Bul. 125; Cir. 10, Iowa; Liming, Wis. Bul. 230; Wis. Bul. 202; (Drainage)—Wis. Buls. 138, 199, 229; Wis. Bul. 205; Boss, p. 102-112; Wis. Bul. 204
  - (a) Effects of various methods of tillage
  - (b) Relation of live stock to soil fertility
  - (c) Effect of crop rotation
  - (d) Value of green manuring
  - (e) Liming—costs, value, etc.
  - (f) Management of clay soils: special cultivation, drainage, crops, adapted, and maintenance of fertility
  - (g) Management of marsh soils: Same as under f
  - (h) Management of sandy soils: Same as under f
- (2) Management of Live Stock. Wis. Bul. 235; Warren, p. 212-217; Wis. Ext. Cir., Literature of Live Stock Breeders' Assn.; Hart's Agr. Chem., p. 119-154; Wis. Bul. 221; Eckles Dairy Cattle p. 132-154; Boss, p. 195-196; Warren, p. 217-220; Community facts; Facts from general knowledge; Article in Country Gentleman, Jan. 16, 1915; Articles in Breeders' Gazette from time to time, studies in the neighborhood; Boss, p. 123-140
  - (a) Value of soiling crops
  - (b) Value of silage
  - (c) Economy of proper rotations
  - (d) Value of pure bred sires
  - (e) Economy in handling of manure
  - (f) Importance of keeping milk records and of testing
  - (g) Value of county breeders' associations
  - (h) Value of cow testing associations
  - (i) Profits of fall feeding
  - (j) Economic study of stockers and feeders

- (3) Machinery. Boss, p. 112-122; Minn. Bul. 117; Warren, Chap. 12
- (a) Capital to be invested in. See Capital
  - (b) Depreciation due to use and misuse
  - (c) Housing and protection
  - (d) Economy of good care
- (4) Management of Labor. Boss, pp. 140-152; Warren, p. 331-354; Cornell Bul. 295
- (a) Kinds of farm labor—ordinary and managerial
  - (b) Contracts and terms of hire
  - (c) Means of increasing the efficiency of farm labor: Bonuses, presents, shares
  - (d) Value of furnishing steady employment
  - (e) Number of hours per day
  - (f) Rainy day schedules
- c. Business Side of Farming. Boss, p. 20-34
- (1) Factors of Production. Chap. 2, Taylor's Ag. Economics; Unpublished Bulletin by Otis; Boss, p. 18; Warren, p. 290 and 295; Report of Director, Wis. Station, 1913, p. 12-15
- (a) Land—Relative prices of throughout U. S.
  - (b) Labor
  - (c) Capital. Relative proportions in fixed and operative  
Relation of capital to profits  
Relation of capital to type of farming
- (2) Farm Bookkeeping—Eight Weeks. Warren, p. 428-429; Boss, p. 177-198; U. S. Bul. 511; Farm record book of Nat. Phosphate Co.; Cole's Accts; Vye's Accts; Cornell Bul. 295; Otis' Farm Management blanks; Otis' New Bookkeeping Book (This book is a simple book of single entry and seems to be about the most sensible at the present time for the average farmer).
- (a) Studies in inventories, cash and bank, live stock, crop, personal, accounts, summaries of business Records,—feed, milk and labor, feeding records  
Farm surveys and analyses—to find where profits and losses are
  - (b) Need of office equipment  
Parts of: letter and receipt files, bulletin cases  
Value of letter heads, methods of indexing
  - (c) Value of advertising and of farm names  
Value of reading farm papers and bulletins
- (3) Factors Affecting Farm Profits—from study of successful farms. Studies of summary sheets for the different counties entered, in annual State Farm Contest—available at College of Agriculture; Boss, p. 199-214; Warren, p. 535-565
- (a) Man hours per man per year
  - (b) Horse hours per horse per year
  - (c) Receipts per cow per year
  - (d) Receipts per horse per year
  - (e) Receipts per ewe per year
  - (f) Receipts per sow per year



- (4) Marketing and Coöperation. Boss, p. 204-211; Warren, p. 416-428
    - (a) Time to sell products—seasonal periods of high prices
    - (b) How to market
    - (c) Value of grading and packing
  - d. Cost Accounting. U. S. Bul. 572; U. S. Bureau of Statistics, Bul. 73; Minn. Bul. 124; Boss, p. 167-176; Warren, p. 440-493
    - (1) Costs of producing grains
    - (2) Costs of dairy products
    - (3) Costs of man labor and horse labor
    - (4) Costs of shelter
    - (5) Costs of upkeep of buildings, machinery and fences
  - e. Choosing a Farm. Boss, p. 53-63; Warren, p. 517-534; Bailey, Vol. 1, p. 133-139
    - (1) Healthfulness, neighbors
    - (2) Nearness to market
    - (3) Schools and churches
    - (4) Suitability to buyer
    - (5) Producing capacity, soil, climate

Study of Farm Score Card—See Boss, 62
  - f. Study of Farm Home
    - Home conveniences; water supply, heating, lighting, sewage systems
    - Labor saving devices
  - g. Development of American Agriculture. Boss, p. 7-14; Carver Rural Economics; Taylor, Chap. 11; Boss, p. 35-42
    - (1) History of settlements
    - (2) History of development of ranges—Homesteading
    - (3) History of development of machinery
    - (4) History of live stock improvement
    - (5) Changes from grain farming to dairying in Wisconsin
    - (6) Changes in methods of acquiring land—Land values, rentals, cash and share rents, mortgage and the use of it
- 3. Special Reports by Pupils**
- a. Wisconsin Farm Management Contests.
  - b. Reports on successes of special people in special lines of farming.
  - c. The history of the development of farm machinery

### MANUAL TRAINING

This work is well adapted to arouse unusual interest in pupils at the very beginning of the high school course. Furthermore, some work in this line is of the greatest value in connection with the agricultural course. The work should in general consist of a series of practical construction projects, which should be related as closely as possible to the projects in agriculture and to the home needs of the pupils. Some instruction should be given in the use and care of tools and in the proper methods of setting screws, driving nails, planing surfaces and edges, constructing joints and

doing other typical forms of work. However, in schools not having regular manual training departments, there need not be much formal class work. Pupils need not necessarily work altogether in set periods, but may put in considerable work at odd times. The teacher should meet the whole class occasionally to talk over work done and plan new work.

A minimum of three hours should be devoted to the work each week. If pupils are properly directed they will probably be eager to spend a much larger amount of time on their projects. As previously stated, schools offering the regular manual training course should not expect agriculture students to take this course, but should arrange a briefer course especially adapted to farm needs for these students. The idea here should be to develop some skill as a rough carpenter or blacksmith rather than to train a skilled artisan or cabinet maker. Pupils should be encouraged to bring articles from home that need repair and this repairing should be counted as a part of the school work. Wherever possible pupils should further be encouraged to set up a shop at home for bench and forge work. The whole idea should be not to give a highly developed manual training course, but to give the largest opportunity possible for rural pupils to work out the practical problems of their home life along this line under the conditions of the smaller high school of the rural type. With the teaching force available in most of these schools the highly systematized course is not possible, whereas a large amount of valuable work can be done if opportunity is offered, with such instruction as the agriculture teacher can give and with a very small equipment.

Further helpful suggestions will be found in the following bulletins of this department: High School Manual, Common School Manual, 16th edition, and the Special Manual Training bulletin for high schools. Two valuable books for the kind of work outlined here are: Brace and Mayne—Farm Shop Work—American Book Co.; Roehl—Agricultural Woodworking—Bruce Publishing Co., Milwaukee. The former treats of woodworking, blacksmithing, cement and concrete work, and leather work, while the latter is devoted entirely to woodworking. Both books give many valuable sketches and designs.

It is advised that good work benches be purchased, but satisfactory ones may be made by the class. One of the first exercises may be the construction of benches, or if benches are purchased, the setting up of benches and construction of tool racks, cupboards, etc. This should be a class project planned and directed by the instructor but done very largely by the pupils. In one place in the state a shop building, 16' x 24' x 8', made of cement blocks, was made by the pupils and fitted up with benches, forge, tools, cases, etc. When a good shop has been arranged the following outline of work may be taken up.

FIRST YEAR

**Woodworking Projects**

Use and care of tools: names, purpose of each, handling, sharpening, keeping in place. Introduce this instruction as it is needed in connection with the projects rather than all at one time.

Free hand sketches or working drawings of problems; how to lay out a drawing, how to show dimensions, how sections are shown, labeling, lettering, use.

$\frac{1}{8}$ " cross section paper is useful for full size and scale drawings. Some practice should be given in making assembled or complete drawings, and in doing neat labeling by use of figures or letters. A few drawing instruments are useful for showing inclined faces, tangent edges, circles, sections, etc., but it is not necessary that a complete set of drawing instruments should be obtained for this part of the work. Emphasize pencil drawing for the first year.

**Projects:** These should emphasize the smaller type of problem that may be used about the farm home or the farm. The following list will give a good opportunity for selection:

Tool chest	Seed testing box
Hammer handle	Bird house
Miter box	Chicken coop
Nail box	Chicken feed box
Sawhorses	Trap nest
Workbench	Egg tester
Sawbuck	Corn rack
Sewing horse	Corn dryer
Bench hook	Gate
Stepladder	Sheep feeding trough
Milk stool	Cattle rack
Neck yoke	Wagon box
Whippletree	Hayrack
Wagon jack	Hog rack
Wagon reach	Dog house
Three horse evener	Portable hog house
Wash bench	Road drag
Wheelbarrow	Tree pruner
Clothes stick	Blue print frame
Clothes rack	Table for milk tester or other purpose
Farmer's level	

SECOND YEAR

**Woodwork and Forge Work**

If it cannot be arranged to secure a forge, the work of the previous year may be extended to cover the second year. If possible the woodwork should be combined with the forge work. Many of the projects listed above require some iron work for completion. It is sometimes possible to make arrangements for the boys to do

some work at a local blacksmith shop in completing this necessary iron work. The complete outfit for one forge need not cost over \$50.00. See list of equipment.

The work should be along the lines outlined under woodwork including use and care of tools, working drawings and working out of projects.

**Projects:** The following ironworking projects are suggested in addition to the ironwork required for woodworking projects such as those in the above list.

Staple	Swivel
Gate hook	Clevice
Bolt	Shovel and poker
Iron stakes	Harness hook
Chain links	Wrench
Tongs	

Leather work connected with ordinary harness repairing may be taken up if there is time. A very small equipment is required. See equipment. The sewing horse may be made. The work should include cutting, shaping, fitting and sewing of leather needed for emergency repairing of harness and belting. For further suggestions see Brace and Mayne—Farm Shop Work.

#### THIRD YEAR

#### Mechanical Drawing

For this work a drawing board may be made or purchased. Drawing instruments should be purchased by each pupil. For prices see Central Scientific Company, Catalog M, or C. H. Stoelting Company, Chicago. Special drawing tables are desirable but not necessary. They are often constructed by pupils where sufficient equipment and time are available.

The work in this course should extend and give further practice in free hand sketching and the making of working drawings in connection with the projects undertaken in the previous work. From this viewpoint, the work should be made as practical as possible in dealing with problems which are of interest and use to the pupils. At the same time, the plan of work should aim to give a more systematic treatment of the typical operations and conventions used in the best drawing room practice. A good manual should be in the hands of the teacher as a guide. See under literature of Farm Mechanics and Mechanical Drawing. Some especially simple and helpful material is to be found in Chapter I of the Supplement of Burton's "Shop Practice."

Attention should be given to the following phases of work as far as time permits: Use of Gothic letters and figures, use of scale drawings, mechanical lines, free hand drawing of problems on  $\frac{1}{8}$ "

cross section paper, use of drawing instruments for problems having inclined faces, tangent edges, circles and sections, perspective sketching and elevation drawings, orthographic projection from free hand working drawings, tracing and blue printing, geometrical constructions.

#### FOURTH YEAR

### Cement Work and Farm Building Construction

This work should be linked very closely with the Farm Mechanics of the first semester.

For the concrete work, instruction should be given in the proper mixing of concrete, making of forms and methods of reinforcing. The forms should be made by the pupils in most cases. Silo forms may be obtained through the agricultural college.

The projects should as far as possible grow out of actual community needs or be connected with other school and home projects. To illustrate, the farm mechanics class at Mondovi built a cement block farm shop. At Dodgeville the frame for a hotbed was constructed. Cement shower baths and basement floor were constructed at Sun Prairie. West Side high school class at Green Bay put in a concrete floor in the school barn. The following list of projects is suggested. Most of them have been carried out in the state.

#### List of Concrete Projects

Sidewalks and floors	Fence posts
Steps and foundation walls	Flower boxes
Silo foundations	Lawn seats
Feed troughs	Hotbed frame

The work in farm building construction should also be of a practical nature. At Green Bay West Side and at Viroqua, small school barns have been constructed. At Green Bay, East and West sides, poultry houses have been built. The cement block shop at Mondovi, already referred to, gave considerable practice in farm carpentry as well as in cement work. In a large number of places pupils have constructed poultry houses at home.

The instruction side should be covered in the Farm Mechanics, (See outline), and the work here may be considered as the laboratory part of that work. The work should include the drafting of detailed plans, the making of blue prints and the erecting of small farm buildings such as barns, milk rooms, garage sheds, hog houses, poultry houses, etc. The architectural drafting should be broad enough to include complete estimates of quantity and cost of material. A study should be made of different methods of constructing barn frames, of different styles of roof, etc. It may often be

arranged to have the class coöperate with some farmer in the erection of a barn or other farm building for which pupils may draw plans and perhaps do some work. The class might arrange to erect some small building such as a poultry house, hog house or garage and then sell it to some member of the community. The work could be done at school and then the building could be moved to the place directed by the purchaser. No fixed plan or set of projects can be laid down for this work. The teacher will have to arrange for what is possible in this line under the local conditions existing in the school and community. Some work adapted to the local needs is exceedingly valuable and should be developed as far as is possible. The work may be extended through the last semester running parallel with the Farm Management if projects are uncompleted and time can be given to them.

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## IX. AGRICULTURAL LITERATURE

It is expected that every high school department of agriculture receiving state aid will provide a good working library for this work. At least twenty dollars should be provided the first year the course is organized, and ten or twelve dollars additional should be furnished for this purpose each following year, at least for a number of years. Bulletins should be collected as rapidly as possible. Many of these can be secured free of cost, but some will have to be purchased. The agricultural teacher should keep in touch with the U. S. Department of Agriculture, the various experiment stations and other agencies supplying bulletin material. Lists of publications are furnished by all of these agencies on request. In many cases you can have your name placed on the mailing list to receive publications as they come out. The U. S. Department of Agriculture publishes a monthly list of publications, which will be mailed you regularly on request. See under "Bulletins".

All bulletins should be classified according to subject and then filed so as to be kept in good condition and so as to be easily consulted. The library file boxes furnish altogether the best plan of filing, both from the standpoint of appearance and convenience. They can be purchased at small expense. See under "Equipment." A stock of at least fifty should be provided when the course is organized and a supply should be kept on hand for use as new bulletins are received. Perhaps the most complete system of filing bulletins is to place them in the boxes in the order of number and then prepare a subject card catalog with references to numbers. However, where the stock is not large a very satisfactory method is to file them in the boxes by subjects or titles. In connection

with the following lists of books the teacher should consult also the High School library list and the Township library list furnished by the state department.

Valuable bibliographies on secondary school agriculture may be found in the following publications:

- List of texts and references in agriculture for secondary schools, U. S. Department of Agriculture, States Relation Service, July 1, 1916. Dec. 6, A. I. 1. (Especially good)
- Crosby and Howe. Free publications of the Department of Agriculture, classified for the use of teachers, U. S. Department of Agriculture.
- Noyes. Teaching material in government publications. U. S. Bureau of Education, Bulletin No. 47. Whole number 558, 1913.
- Second annual report, School Garden Association of America, 1913, Dayton, Ohio.
- Hatch. The high school course in agriculture. Second edition (revised). Bul. of University of Wisconsin, No. 594, H. S. series, No. 12.
- Hawkins. Agriculture in the high school. University of the State of N. Y., Bul. No. 563, Albany, 1914.

Since Jan. 1915, an Agricultural Education Monthly has been published by the U. S. Department of Agriculture, Office of Experiment Stations, States Relation Service. This may be had on request. It has already been sent to most of the high school agricultural departments. Several good bibliographies on agricultural subjects have appeared in this.

### 1. Farm Plant Life

- \*Goff-Moore-Jones, The principles of plant culture, 8th edition (1)
- Green, Popular fruit growing (9)
- Green, Vegetable gardening (9) Latest Ed.
- Lloyd, Productive vegetable gardening (24)
- Sears, Productive orcharding (24)
- \*French, The beginners garden book (1)
- Greene, Among school gardens (4)
- Russell & Hastings, Agricultural bacteriology (17)
- Bailey, Garden making (1)
- Corbett, Garden farming, (2)
- Tracy, Tomato culture (3)
- Waugh, The American apple orchard (3)
- Phillips, Beekeeping (1)
- Card, Bush fruits (1)
- \*Bailey, Principles of fruit growing (1)
- Sanderson, Insect pests of farm, garden & orchard (10)
- Bailey, The forcing book (1)
- Meir, The school & home gardens (2)
- Bailey, Pruning book (1)
- Snyder, Fights of the farmer (24)

- Taft**, Greenhouse construction (3)  
**Taft**, Greenhouse management (3)  
**Wilkinson**, Modern strawberry growing (12)  
**White**, Principles of horticulture (1)  
**Lodemann**, Spraying of plants (1)  
 \***Montgomery**, Productive farm crops (24)  
 \***Livingstone**, Field crop production (1)  
 \***Wilson & Warburton**, Field crops (9)  
**Clute**, Agronomy (2)  
**Harris & Steward**, Principles of agronomy (1)  
**Hunt**, Cereals in America (3)  
**Hunt**, Forage & fiber crops in America (3)  
**Parker**, Field management & crop rotation (9)  
**Stevens & Hall**, Diseases of economic plants (1)  
**Wing**, Alfalfa farming in America (15)  
**Wing**, Meadows & pastures (15)  
**Grubb & Guilford**, The potato (12)  
**Frazer**, Potato (3)  
**Montgomery**, Corn crops (1)  
**Bowman & Crossley**, Corn (5)  
**Pammel**, Weeds of the farm & garden (3)  
**Barley & Gilbert**, Plant breeding (1)  
**Gray**, Field, forest & garden analytical key (20)  
**Georgia**, Manual of weeds (1)  
**Smith**, How to grow 100 bushels of corn per acre on worn-out soil (26)  
**Shaw**, Clovers & how to grow them (9)  
**Shaw**, Grasses & how to grow them (9)

## 2. Animal Husbandry, Dairying & Poultry

- \***Harper**, Animal husbandry for schools (1)  
 \***Harper**, Manual on farm animals (1)  
 \***Plumb**, Beginning in animal husbandry (19)  
 \***Eckles**, Dairy cattle & milk Production (1)  
 \***Lewis**, Poultry keeping (24)  
**Hunt & Burkett**, Farm animals (3)  
**Henry & Morrison**, Feeds & feeding (13)  
**Farrington & Woll**, Testing milk and its products (21)  
**Van Norman**, First lessons in dairying (3)  
**Curtis**, Live stock judging and selection (11)  
**Lippincott**, Poultry production (11)  
 \***Michels**, Dairy farming (22)  
**American poultry association**, American standard of perfection, Latest Ed.  
**Lewis**, Productive poultry husbandry (24)  
**Lewis**, Poultry keeping (24)  
**Craig**, Common diseases of farm animals (24)



- Craig, Judging live stock (31)
- Woll, Productive feeding of farm animals (24)
- Harper, Breeding of farm animals (3)
- Hadley, Horse in health & disease (25)
- Mumford, Beef production (5)
- Kleinheinz, Sheep management (16)
- Robinson, Principles & practice of poultry culture (2)
- Plumb, Types & breeds of farm animals (2)
- Bruce, 50 years among Shorthorns (23)
- Wing, Milk & its products (1)
- Roberts, Cattle breeds & origin (28)

### 3. Soils & Crops

- \*Whitson & Walster, Soil & soil fertility (9)
- \*Hunt & Burkett, Soils & crops (3)
- \*Parker, Field management & crop rotation (9)
- \*Cunningham & Lancelot, Soils & plant life (1)
- Stoddart, Chemistry of ariculture (11)
- King, Farmers of forty centuries (18)
- Elliot, Practical farm drainage (10)
- Lyon & Fippin, Principles of soil management (1)
- Snyder, Soils & fertilizers (1)
- \*Burkett, Soils (3)
- Hilgard, Soils (1)
- Hopkins, Soil fertility & permanent agriculture (2)
- King, The soil (1)
- McCall, Physical properties of soils (3)
- Vivian, First principles of soil fertility (3)

### 4. Farm Mechanics and Mechanical Drawing

- \*Davidson, Agricultural engineering (9)
- King, Ventilation (18)
- Brace & Mayne, Farm shop work (20)
- Davidson & Chase, Farm machinery & farm motors (3)
- Brookes, Gas & oil engine handbook (14)
- Cobleigh, Handy farm devices & how to make them (3)
- Ekblaw, Farm structures (1)
- King, Physics of agriculture (18)
- Clarkson, Pratical talks on farm engineering (12)
- Roehl, Agricultural woodworking (27)
- Goss, Bench work in wood (2)
- Powell, Farm plans & farm buildings (3)
- Roberts, The farmers' business handbook (1)
- Burton, Shop projects based on community problems (29)
- Crawshaw and Phillips, Mechanical drawing for secondary schools (30)

**5. Farm Management & Accounts**

- \***Boss**, Farm management (26)
- \***Warren**, Farm management (1)
  - Warren**, Laboratory exercises in farm management (1)
  - Green**, Law for the American farmer (1)
  - Powell**, Coöperation in agriculture (1)
  - Carver**, Principles of rural economics (2)
  - Taylor**, Agriculture economics (1)
  - Roberts**, The farmstead (1)
  - Roberts**, Farmers' business handbook (1)
  - Willis**, Farmers' manual of law (3)
  - Culter**, Coöperation among farmers (16)
  - Cards**, Farm management (12)
  - Wilson**, The evolution of the country community (19)

**6. General Agriculture**

- Cromwell**, Agriculture & life (24)
- Mayne & Hatch**, High school Agriculture (20)
- Halligan**, Fundamentals of Agriculture (18)
- Waters**, The essentials of agriculture (2)
- Benson & Betts**, Agriculture (6)
- Warren**, Elements of agriculture (1)
- Bailey**, Principles of agriculture (1)
- Davis**, Productive farming (24)
- Gehrs & James**, One hundred exercises in agriculture (1)
- Ivins & Merrill**, Practical lessons in agriculture (20)
- Call & Schafer**, A laboratory manual in agriculture (1)
- Sell**, Agricultural laboratory manual—soils (2)

**7. Books for the Agricultural Teacher**

- Leake**, The means & methods of agricultural education (7)
- Hummell**, Material & methods in high school agriculture (1)
- Davenport**, Education for Efficiency (8)
- Parker**, Methods of teaching in high schools (2)
- Bricker**, The teaching of agriculture in the high school (2)
- Quick**, The brown mouse (6)
- Pickard**, Rural education (9)
- McKeever**, Farm boys & girls (1)
- Kern**, Among country schools, (2)

**List of Publishers****Key number**

- ( 1 ) The Macmillan Company, Prairie Ave. & 25th St., Chicago
- ( 2 ) Ginn & Company, 2301 Prairie Ave., Chicago
- ( 3 ) Orange Judd Company, Marquette Bldg., Chicago
- ( 4 ) Charities Publishing Committee, 158 Adams St., Chicago
- ( 5 ) Waterloo Publishing Company, Waterloo, Iowa
- ( 6 ) Bobbs-Merrill Company, Indianapolis, Indiana
- ( 7 ) Houghton-Mifflin Company, New York City
- ( 8 ) D. C. Heath & Co., 623 S. Wabash Ave., Chicago

- (9) Webb Publishing Co., 55-67 E. 10th St., St. Paul, Minn.
- (10) John Wiley & Sons, 43-45 E. 19th St., New York, N. Y.
- (11) Lea & Febiger, Philadelphia, Pa.
- (12) Doubleday, Page & Company, Garden City, N. Y.
- (13) Henry-Morrison Company, Madison, Wis.
- (14) F. J. Drake & Company, Chicago
- (15) Sanders Publishing Company, 542 S. Dearborn, Chicago
- (16) Sturgis & Walton Company, 31-33 E. 27th St., New York, N. Y.
- (17) E. G. Hastings, Experiment Station, Madison, Wis.
- (18) Mrs. F. H. King, 1540 University Ave., Madison, Wis.
- (19) The Pilgrim Press, Boston, Mass.
- (20) American Book Company, 330 E. 22nd St., Chicago
- (21) Mendota Book Company, Madison, Wis.
- (22) John Michels, Farmingdale, New York
- (23) Vinton & Company, Limited, London, England
- (24) J. B. Lippincott Company, E. Wash. Square, Philadelphia, Pa.
- (25) W. B. Saunders Company, Philadelphia, Pa.
- (26) Stewart & Kidd, Cincinnati, Ohio
- (27) The Bruce Publishing Co., Milwaukee, Wis.
- (28) David Roberts, Waukesha, Wis.
- (29) Vocational Supply Co., Muncie, Ind.
- (30) Scott, Forsman and Co., Chicago
- (31) Kenyon Co., Des Moines, Ia.

\* Suitable for High School Texts

The Eau Claire Book & Stationary Company of Eau Claire, Wis., will give a special discount on all books listed on the Township Library List. Not all of the suggested list are on the library list. The above company and the A. C. McClurg Company of Chicago, will submit prices on books for your library.

See also township library and high school library lists of books on agriculture, published by the State Department of Education.

### Magazines

- Hoard's Dairyman, Fort Atkinson, \$.85  
 Wisconsin Agriculturist, Racine, \$.50  
 The Breeders' Gazette, Sanders Pub. Co., Chicago, \$2.00  
 Kimball's Dairy Farmer, Waterloo, Ia., \$1.00  
 American Poultry World, Am. Pub. Company, Buffalo, N. Y., \$.50  
 American Poultry Journal, Chicago, \$1.00  
 Orange Judd Farmer, Chicago, \$1.00  
 Wallace's Farmer, Des Moines, Ia., \$1.00  
 The Fruit Grower, St. Joseph, Mo., \$.50  
 The Garden Magazine & Farming, Doubleday, Page & Co., 133 W. 16th St., Garden City, New York, \$1.50  
 Market Growers' Journal, Louisville, N. Y., \$1.00  
 Farm Engineering, Chicago, \$.50  
 Wisconsin Horticulture, Horticulture Secy., Madison, \$.50

### Bulletins

The best reference materials you can secure are the bulletins of your Agriculture Experiment Station. The unfortunate thing is that they are not available at all times. An edition of agricultural bulletins usually is available for less than two years. Agricultural instructors have sent for ten to thirty copies and after using them in the class work they have allowed the pupils to take them home.

They have, without doubt, done good service in the home but the next season the instructor has probably found it impossible to secure a supply of the bulletins for class work. A better plan would be to secure enough copies for class work and file in bulletin cases as part of the agricultural library. Pupils using the bulletin can secure copies by writing to the Wisconsin Agricultural Experiment Station at Madison or if unavailable borrow the bulletin from the local agricultural library the same as an agricultural reference book.

The Agricultural Experiment Stations of any other states will often send bulletins for your library. The bulletins of the following experiment stations are probably the most important for Wisconsin schools. Address the Agricultural Experiment Station at the following places and ask for a list of available bulletins.

Minnesota, University Farm, St. Paul  
 Michigan, East Lansing  
 Illinois, Urbana  
 Iowa, Ames  
 Indiana, LaFayette  
 Pennsylvania, State College  
 Missouri, Columbia

Much valuable literature may be secured from the U. S. Department of Agriculture. Write the Editor and Chief of the Division of Publications, U. S. Department of Agriculture, Washington, D. C., and ask to be placed on the mailing list for the bulletin "Monthly List of Publications". Copies of Farmers' bulletins, departmental bulletins, etc. may be obtained free upon application to the Editor and Chief of the Division of Publications as long as the department's supply lasts.

After the department's supply of publications is exhausted, copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., but by purchase only. Send all remittances to the Superintendent of Documents direct. His office is not a part of the Department of Agriculture. Catalogs listing bulletins for sale are issued by the Superintendent of Documents on the following subjects: American foods and cooking, U. S. geological survey publications, farmer's bulletins, education, fishes, animal industry, birds, insects, agricultural experiment stations, forestry, plants, roads, soils and fertilizers; health, disease and sanitation, bee culture investigations, chemistry as related to agriculture. Send for these price lists.

#### **Bulletins of U. S. Department of Education**

Agricultural instruction in high schools by C. H. Robinson and F. B. Jenks, Bulletin No. 6, 1913, 10c  
 Agricultural instruction in secondary schools. Bulletin No. 14, 1913, 10c  
 Agricultural and rural life day; material for its observance. Eugene C. Brooks, Bulletin No. 43, 1913, 10c  
 Teaching material in government publications, F. K. Noyes, Bulletin No. 47, 1913, 10c  
 Agricultural teaching, Bulletin No. 27, 1914, 10c  
 Vocational secondary education. Bulletin No. 21, 1916

## APPENDIX

## NATIONAL REGISTRY ASSOCIATION

## Beef Cattle

<i>Organization</i>	<i>Secretary</i>	<i>Address</i>
Am. Aberdeen Angus Breeders' Assoc.....	Chas. Gray .....	Chicago, Ill.
Am. Galloway Breeders' Assoc. ....	K. W. Brown.....	Carroiton, Mo.
Am. Hereford Cattle Breeders' Assoc.....	K. J. Kinzer.....	Kansas City, Mo.
Am. Polled Hereford Breeders' Assoc.....	B. O. Gammon.....	Des Moines, Ia.
Am. Polled Durham Breeders' Assoc.....	J. H. Martz.....	Greenville, Ohio
Am. Shorthorn Breeders' Assoc.....	Frank W. Harding..	Chicago, Ill.

## Dairy Cattle

Ayrshire Breeders' Assoc.....	C. W. Winslow.....	Brandon, Vt.
Brown Swiss Cattle Breeders' Assoc.....	Ira Inman .....	Beloit, Wis.
Dutch Belted Cattle Assoc. of America.....	E. J. Kirby .....	Covert, Mich.
Am. Guernsey Cattle Club.....	Wm. H. Caldwell.....	Peterboro, N. H.
Holstein-Friesian Assoc. of America.....	F. L. Houghton.....	Peterboro, Vt.
American Jersey Cattle Club.....	K. M. Gow.....	New York, N. Y.

## Dual Purpose Cattle

Am. Devon Breeders' Assoc.....	L. P. Sisson.....	Newark, Ohio
Milking Shorthorn Cattle Club.....	C. B. Wade.....	Orangeville, Ohio
Red Polled Cattle Club of America.....	H. A. Martin.....	Gotham, Wis.

## Horses

Am. Assoc. of Importers and Breeders of Belgian Draft Horses.....	J. D. Connor, Jr....	Wabash, Ind.
Cleveland Bay Society.....	K. F. Stiercker.....	Orange, N. J.
French Coach Society.....	Duncan E. Whitet...	Oak Park, Ill.
German Hanoverian and Oldenburg Coach Horse Association .....	J. Crouch .....	LaFayette, Ind.
American Clydesdale Association.....	K. B. Ogilvie.....	Chicago, Ill.
National French Draft Horse Assoc.....	C. E. Stubbs.....	Fairfield, Ia.
The Morgan Horse Club.....	C. C. Stillman.....	New York City
Percheron Society of America.....	Wayne Dinsmore ..	Chicago, Ill.
American Shetland Pony Club.....	John M. Wade.....	LaFayette, Ind.
American Sire Horse Assoc.....	Chas. Burgess, Sr..	Wenona, Ill.
American Suffolk Horse Assoc.....	A. Graham Gaibrach	DeKalb, Ill.
Thoroughbred or American Stud Book.....	W. H. Rowe.....	New York, N. Y.
American Trotting Register.....	W. H. Knight.....	Chicago, Ill.
Welsh Pony and Cob Society of America.....	Julia M. Wade.....	LaFayette, Ind.
Am. Breeders' Assoc. of Jacks & Jennets...	J. W. Jones.....	Columbia, Tenn.
Standard Jack & Jennet Registry of Am...	Wm. E. Morton....	Kansas City, Mo.

## Sheep

American Cheviot Sheep Society.....	F. E. Dawley.....	Fayetteville, N. Y.
American Cotswold Sheep Assoc.....	F. W. Harding.....	Waukesha, Wis.
Continental Dorset Club.....	Edna Chidester.....	Mechanicsburg, Ohio
Am. Hampshire Down Sheep Assoc.....	Comfort A. Tyler...	Coldwater, Mich.
Am. Leicester Breeders' Assoc.....	A. J. Temple.....	Canton, Ohio
National Lincoln Sheep Breeders' Assoc.....	Bert Smith .....	Sherlock, Mich.
Am. Delaine Merino Record Assoc.....	Beulah M. McDowen.	Canton, Ohio
Delaine Merino Record Assoc.....	J. B. Johnson.....	Cannonsburg, Pa.
German Merino Assoc.....	E. N. Ball.....	Ann Arbor, Mich.
Spanish Merino Assoc.....	Wesley Bishop.....	Delaware, Ohio
American Oxford Down Record Assoc.....	W. A. Snator.....	Hamilton, Ohio
Am. Rambouillet Sheep Breeders' Assoc.....	Dwight Lincoln .....	Arlford Center, Ohio
International Von Homer Rambouillet Club .....	E. N. Ball.....	Ann Arbor, Mich.
Am. Shropshire Registry Assoc.....	Julia M. Wade.....	LaFayette, Ind.
Am. Southdown Breeders' Assoc.....	Frank S. Springer..	Springfield, Ill.

**Swine**

<i>Organization</i>	<i>Secretary</i>	<i>Address</i>
American Berkshire Breeders Assoc.....	F. S. Springer.....	Springfield, Ill.
Chester White Swine Record Assoc.....	F. F. Moore.....	Rochester, Ind.
Ohio Improved Chester White Swine Breeders' Assoc. ....	O. O. Vernon.....	Goshen, Ind.
Am. Duroc Jersey Swine Breeders' Assoc....	R. J. Evans.....	Chicago, Ill.
National Duroc Jersey Record Assoc.....	J. R. Pfander.....	Peoria, Ill.
American Hampshire Swine Record Assoc....	E. C. Stone.....	Peoria, Ill.
American Mule Foot Hog Record Assoc.....	R. E. Pfeiffer.....	Columbus, Ohio
American Poland China Record Assoc.....	W. M. McFadden....	Chicago, Ill.
National Poland China Record Company...	A. M. Brown.....	Winchester, Ind.
Southwestern Poland China Record Assoc....	H. P. Wilson.....	Gadsen, Tenn.
American Tamworth Swine Record Assoc....	E. N. Ball.....	Hamburg, Mich.
American Yorkshire Club.....	Harry G. Krum.....	White Bear Lake, Minn.

## STANDARDS FOR THE LEADING VARIETIES OF WISCONSIN CORN.

		Silver King Wis. No. 7	Murdock Wis. No. 13	Golden Glow Wis. No. 12	Early Yellow Dent Wis. No. 8	Smut Nosed Flint Wis. No. 15
Ear.....	Shape	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical
	Length	8½-9½ in.	8½-9½ in.	8½-9½ in.	8-9 in.	10-11 in.
	Circumference	7-7½ in.	7-7½ in.	6½-7 in.	6-6½ in.	5-5½ in.
Kernel....	Color	Cream white	Orange yellow	Deep yellow	Lemon yellow	Brownish yellow turning to dark red at tip of ear
	Indentation	Very crumpled to pinched	Very crumpled to pinched	Crumpled	Smooth	None
	Shape	Medium deep wedge	Medium deep wedge	Medium wedge	Short wedge	Rounding shallow
Rows.....	Number	16-20	16-20	14-18	12-16	8
	Space	Narrow	Narrow	Narrow	Narrow	Wide
Butt.....	Shape	Moderately rounded	Moderately rounded	Moderately rounded	Shallow compressed	Flat
	Rows	Straight	Straight	Straight	Straight	Straight
	Kernels	Nearly uniform with middle of ear	Nearly uniform with middle of ear	Nearly uniform with middle of ear	Nearly uniform with middle of ear	Nearly uniform with middle of ear
Tip.....	Rows	Straight	Straight	Straight	Straight	Straight
	Kernels	Nearly full size	Nearly full size	Nearly full size	Nearly full size	Nearly full size
Shank.....	Diameter	¾ in.	¾ in.	¾ in.	¾ in.	¾ in.
	Diameter	1¼-1½ in.	1¼-1½ in.	1¼-1½ in.	1-1½ in.	1-1½ in.
Cob.....	Color	Glistening white	Dark Cherry Red	Cherry Red	Light Cherry Red	Glistening white
	Percentage of corn	87	87	86	85	.....



COMPARISON OF THRESHED SAMPLES OF BARLEY

Quality	Two Row	Six Row
1. Size.....	Very large.....	Medium to large
2. Plumpness.....	Very plump.....	Medium plump
3. Shape.....	Rounded and full.....	Not as rounding with long taper
	Short rounding taper	
4. Variation in Cheeks of Kernels.....	No variation.....	are twisted
5. Color.....	Nearly dead white.....	Light straw color
6. Hardness.....	Quite starchy and medium hard.....	Hard to medium hard
7. Appearance of cross section.....	Starchy.....	Partly flinty
8. Appearance of berry coverings.....	Wrinkled palea at right angles to long axis.....	Smoother coverings
9. Thickness of coverings..	Thin.....	Medium thick

COMPARISON OF THRESHED SAMPLES OF WISCONSIN OATS

Quality	Sweedish Select Ped. No. 5	Wisconsin Wonder Ped. No. 1	Sixty Day Ped. No. 6
Color.....	White.....	White.....	Yellow
Shape.....	Plump with hump on dorsal side	Long and slender...	Long and slender
Crease.....	Wide and shallow...	Medium wide.....	Narrow to medium wide
Size.....	Very large.....	Large.....	Small
Appearance of Awn	Dark, coarse, twisted at base	Medium coarse.....	Light fine and deciduous
Thickness of hull..	Stiff and medium thick	Stiff and medium thick.....	Thin
Length of tip	Medium to short....	Long.....	Long

COMPARISON OF THRESHED SAMPLES OF WHEAT

Quality	Blue Stem	Marquis	Turkey Red	Durum
Color.....	Grayish brown amber	Rich brown amber	Brown amber to light yellow	Light glassy amber
Shape.....	Medium short to long—slight taper	Short and chunky	Medium to long. Pronounced taper	Long with slight taper
Size.....	Medium to large	Medium to small	Medium to large	Large
Crease.....	Medium wide to narrow and deep	Wide—V shape and medium to deep.....	Narrow and medium to deep...	Wide and medium deep
Cheek.....	Round and full..	Angular and full	Very rounding and full	Angular to medium angular
Hardness ..	Hard.....	Hard.....	Hard	Very hard
Appearance of cross section	Dull glassy amber with traces of starch	Glassy to dull amber with traces of starch	Flinty with traces of starch..	Glassy

TABLE OF IMPORTANT TYPE CHARACTERS OF WISCONSIN POTATOES.

Variety.	Shape.	Skin and Surface Marking.	Size Standard.
Rural New Yorker	Round to oval and flattened. Pronounced spherical and oblong types objectionable.	Smooth, tan color, thin skin. Eyes unevenly distributed.	10 ounces approximately. 2 oz. considered moderate in all varieties.
Green Mountain	Tubers slightly oblong and fairly broad; thickened.	Skin fairly rough netted, creamy buff color. Eyes even.	10 ounces approximately.
Burbank	Long, cylindrical and moderately flattened.	Skin slightly netted, creamy buff. Eyes evenly distributed.	8-10 ounces.
Peerless (Pearl)	Heart shape; stem end sunken.	Skin often netted, checkered, light tan color. Pink tinge around eyes.	8 ounces.
Triumph	Round to flattened. Long types objectionable.	Skin deep rose or pink. Eyes slightly sunken.	7-8 ounces.
Early Ohio	Oblong, thickened type; Blocky type preferred.	Light pink skin, pimpled. Eyes prominent.	8 ounces.
Early Rose	Long, flattened, slightly tapering.	Pink or rose; slightly blotched.	8 ounces.
Irish Cobbler.	Round, somewhat flattened. Stem end slightly sunken.	Bright, creamy tan color. Eyes fairly deep.	7-8 ounces.

**Uniformity.** This point is given much importance in judging in relation especially to *size, shape and color.*

**Soundness,** freedom from hollow centers, black heart, spongy or streaked flesh. These are specific diseases and any serious infestation may completely disqualify. Coarse, green or bruised stock is also very objectionable. A slight and inconspicuous infestation of disease is often a deciding factor against samples otherwise in good condition.

**Cleanness, Brightness, Ripeness** of skin are essential to high quality. Long exposure to light darkens the skin and injures the appearance of tubers. *Never wash tubers.*

Secure Potato Bulletin of Wisconsin Potato Growers' Association—Sec'y. J. G. Milward, Madison, Wis.

# OFFICIAL WISCONSIN SCORE CARDS.

DRAFT HORSES

*Animal*

Name .....

Date .....

SCALE OF POINTS	Pos- sible score	Points deficient	
		Student's score	Cor- rected
<b>GENERAL APPEARANCE—30 POINTS</b>			
Height, 16 hands or over.....			
Weight, 1500 lbs. or over.....			
Weight .....	6		
Form, broad, massive, evenly proportioned, symmetrical, blocky .....	6		
Quality, refined; bone clean, large, strong; tendons, clean, defined, prominent; skin and hair fine; "feather," if present, silky .....	6		
Action, walk, fast, elastic, regular, straight; trot, free, springy, balanced, straight.....	10		
Temperament, energetic; disposition, good.	2		
<b>HEAD AND NECK—10 POINTS</b>			
Head, proportionate size, clean cut, well carried; profile straight.....	2		
Forehead, broad, full.....	1		
Eyes, bright, clear, full, same color.....	2		
Ears, medium size, well carried, alert.....	1		
Muzzle, neat; nostrils large, flexible; lips thin, even, firm.....	1		
Lower jaw, angles wide, space clean.....	1		
Neck, muscled, arched; throat-latch, fine, windpipe large .....	2		
<b>FORE QUARTERS—20 POINTS</b>			
Shoulders, moderately sloping, smooth, snug, extending well back.....	2		
Arm, short strong muscled, thrown back, well set .....	1		
Forearm, long, wide, clean, heavily muscled	1		
Knees, straight, wide, deep, strong, clean..	2		
Cannons, short, wide, clean; tendons clean, defined, prominent .....	2		
Fetlocks, wide, straight, strong, clean....	1		
Pasterns, moderately sloping, strong, clean	3		
Feet, large, even size, sound; horn dense, waxy; soles concave; bars strong, full; frogs large, elastic; heels wide, one-half length of toe.....	8		
<b>BODY—10 POINTS</b>			
Chest, deep, wide; breast bone, low; girth, large .....	2		
Ribs, deep, well sprung, closely ribbed to hip .....	2		
Back, broad, strong, muscular.....	2		
Loins, short, wide, thick muscled.....	2		
Underline, low, flanks full.....	2		
<b>HIND QUARTERS—30 POINTS</b>			
Hips, broad, smooth, level, well muscled...	2		
Croup, wide, heavily muscled, not mark- edly drooping .....	2		
Thighs, deep, broad, strong, muscular.....	2		
Quarters, plump with muscle, deep.....	2		
Stifles, large, strong, muscular, clean.....	1		
Gaskins, (lower thighs), long, wide, clean, heavily muscled .....	2		
Hocks, large, strong, wide, deep, clean, well set .....	8		
Cannons, short, wide, clean; tendons clean, defined, prominent .....	2		
Fetlocks, wide, straight, strong, clean....	1		
Pasterns, moderately sloping, strong, clean	2		
Feet, large, even size, sound; horn, dense, waxy; soles concave; bars strong, full; frogs, large, elastic; heels, wide, one-half length of toe, vertical to ground.....	6		
<b>Total</b> .....	<b>100</b>		

BEEF CATTLE

Student No. .... Date .....

Name ..... Animal .....

SCALE OF POINTS	Possible score	Points Deficient	
		Student's score	Corrected
<b>GENERAL APPEARANCE—26 POINTS</b>			
Weight, estimated.....lbs. according to age .....	6		
Form, straight top line and underline; deep, broad, low set.....	8		
Quality, firm handling; hair fine; skin pliable; fine bone; evenly colored with firm flesh .....	8		
Style, active, upstanding.....	1		
Temperament, quiet, docile.....	3		
<b>HEAD AND NECK—8 POINTS</b>			
Muzzle, good size, mouth large; lips thin, nostrils large .....	2		
Eyes, large, clear, placid.....	1		
Face, short, quiet expression.....	1		
Forehead, broad, full.....	1		
Ears, medium size, fine texture.....	1		
Neck, thick, short, throat clean.....	2		
<b>FORE QUARTERS—13 POINTS</b>			
Shoulder Vein, full.....	3		
Shoulder, covered with flesh, compact on top, snug .....	4		
Breast, wide; brisket prominent.....	2		
Devlap, skin not too loose and drooping.....	1		
Legs, straight, short; arm full; shank fine, smooth .....	3		
<b>BODY—28 POINTS</b>			
Chest, full, deep, wide; girth, large; fore-hank full .....	6		
Crops, full, even with shoulders.....	3		
Ribs, deep, arched, thickly fleshed.....	5		
Back, broad, straight, evenly fleshed.....	8		
Loin, thick, broad.....	5		
Flank, full, even with underline.....	3		
<b>HIND QUARTERS—25 POINTS</b>			
Hips, smoothly covered; distance apart in proportion with other parts.....	4		
Rump, long, even, wide; tail head smooth, not patchy .....	5		
Pin Bones, not prominent, far apart.....	3		
Thighs, full, wide, deep.....	5		
Twist, deep, plump.....	4		
Legs, straight, short; shank fine, smooth.....	2		
Total .....	100		

DAIRY CATTLE

Student ..... Date .....

Animal ..... Animal .....

**GENERAL APPEARANCE**—A dairy cow should weigh not less than 800 pounds, have large capacity for feed, a dairy temperament, well developed milk organs, fine quality and perfect health, and be capable of a large production of milk and butter fat.

SCALE OF POINTS	Per- fect score	Points Deficient	
		Student's score	Cor- rected
<b>INDICATION OF CAPACITY FOR FEED—</b>			
<b>25 POINTS</b>			
<b>Face</b> , broad between the eyes and long; muzzle clean cut; mouth large; lips strong; lower jaws lean and sinewy....	5	.....	.....
<b>Body</b> , wedge shape as viewed from front, side and top; ribs, long, far apart and well sprung; breast full and wide; flanks, deep and full.....	10	.....	.....
<b>Back</b> , straight; chine, broad and open; loin broad and roomy.....	5	.....	.....
<b>Hips and thurls</b> , wide apart and high.....	5	.....	.....
<b>INDICATION OF DAIRY TEMPERAMENT—</b>			
<b>25 POINTS</b>			
<b>Head</b> , clean cut and fine in contour; eyes, prominent, full and bright.....	3	.....	.....
<b>Neck</b> , thin, long, neatly joined to head and shoulders and free from throatiness and dewlap .....	4	.....	.....
<b>Brisket</b> , lean and light.....	2	.....	.....
<b>Shoulders</b> , lean, sloping, nicely laid up to body; points prominent; withers sharp..	4	.....	.....
<b>Back</b> , strong, prominent to tail head and open jointed .....	3	.....	.....
<b>Hips</b> , prominent, sharp and level with back	3	.....	.....
<b>Thighs</b> , thin and incurving.....	4	.....	.....
<b>Tail</b> , fine and tapering.....	1	.....	.....
<b>Legs</b> , straight; shank fine.....	1	.....	.....
<b>INDICATION OF WELL DEVELOPED MILK</b>			
<b>ORGANS—25 POINTS</b>			
<b>Rump</b> , long, wide and level; pelvis roomy	3	.....	.....
<b>Thighs</b> , wide apart; twist, high and open..	3	.....	.....
<b>Udder</b> , large, pliable, extending well forward and high up behind; quarters, full, symmetrical, evenly joined and well held up to body.....	15	.....	.....
<b>Teats</b> , plumb, good size, symmetrical and well placed .....	4	.....	.....
<b>INDICATIONS OF STRONG CIRCULATORY</b>			
<b>SYSTEM, HEALTH, VIGOR AND MILK</b>			
<b>FLOW—25 POINTS</b>			
<b>Eyes</b> , bright and placid.....	2	.....	.....
<b>Nostrils</b> , large and open.....	3	.....	.....
<b>Chest</b> , roomy .....	5	.....	.....
<b>Skin</b> , pliable; hair, fine and straight; secretions, abundant in ear, on body and at end of tail .....	7	.....	.....
<b>Veins</b> , prominent on face and udder; mammary veins, large, long, crooked and branching; milk wells large and numerous .....	7	.....	.....
<b>Escutcheon</b> , wide and extending high up..	1	.....	.....
Total .....	100	.....	.....

SWINE

Animal ..... Date .....  
 Student ..... Standing .....

SCALE OF POINTS	Possible score	Points Deficient	
		Student's score	Corrected
<b>GENERAL APPEARANCE—25 POINTS</b>			
Weight, ..... estimate.....actual lbs. ....	6		
Form, deep, broad, low, long, symmetrical, compact, standing squarely on legs.....	8		
Quality, bone clean; hair silky; skin soft; head and ears refined, evenly covered with firm flesh.....	6		
Disposition, quiet, docile.....	5		
<b>HEAD AND NECK—10 POINTS</b>			
Snout, medium length, not coarse.....	1		
Face, short, cheeks full.....	1		
Forehead, broad.....	1		
Eyes, large, mild, full, bright, wide apart..	1		
Ears, medium size, fine, soft.....	1		
Jowl, strong, neat, broad.....	2		
Neck, thick, medium length.....	3		
<b>FORE QUARTERS—13 POINTS</b>			
Shoulder, symmetrical, broad, deep, full, compact on top.....	6		
Breast, wide, prominent, well let down....	2		
Legs, straight, short, feet and pasterns strong.....	5		
<b>BODY—32 POINTS</b>			
Chest, deep, broad; girth large.....	7		
Sides, deep, lengthy and full.....	8		
Back, broad, straight, thickly and evenly fleshed.....	7		
Loin, thick, wide and strong.....	5		
Belly, straight, even, and firmly fleshed...	3		
Flank, low and well fleshed, girth large..	2		
<b>HIND QUARTERS—20 POINTS</b>			
Hips, wide apart, smooth.....	3		
Rump, long, wide, evenly fleshed, smooth..	4		
Hams, firm, heavily fleshed, deep and wide	8		
Legs, straight, short; feet and pasterns strong.....	5		
Total .....	100		

SCORE CARD FOR HOLSTEIN-FRIESIAN BULL

Parts	Description	Possible score	Dis-credits
<b>Head</b> .....	Showing full vigor; elegant contour..	2	.....
<b>Forehead</b> .....	Broad between the eyes; dishing.....	2	.....
<b>Face</b> .....	Of medium length; clean and trim; especially under the eyes; the bridge of the nose straight.....	2	.....
<b>Muzzle</b> .....	Broad with strong lips.....	1	.....
<b>Ears</b> .....	Of medium size; of fine texture; the hair plentiful and soft; the secretions oily and abundant.....	1	.....
<b>Eyes</b> .....	Large; full; mild; bright.....	2	.....
<b>Horns</b> .....	Short; of medium size at base; gradually diminishing toward tips; oval; inclining forward; moderately curved inward; of fine texture; in appearance waxy.....	1	.....
<b>Neck</b> .....	Long; finely crested (if the animal is mature); fine and clean at juncture with the head; nearly free from dewlap; strongly and smoothly joined to shoulders.....	5	.....
<b>Shoulders</b> .....	Of medium height; of medium thickness and smoothly rounded at tops; broad and full at sides; smooth over front.....	4	.....
<b>Chest</b> .....	Deep and low; well filled and smooth in the brisket; broad between the forearms; full in the foreflanks [or through at the heart].....	7	.....
<b>Crops</b> .....	Comparatively full; nearly level with the shoulders.....	4	.....
<b>Chine</b> .....	Strong; straight, broadly developed, with open vertebrae.....	6	.....
<b>Barrel</b> .....	Long; well rounded; with large abdomen; strongly and trimly held up...	7	.....
<b>Loin and Hips</b> .....	Broad; level or nearly level between hook-bones; level and strong laterally; spreading out from the chine broadly and nearly level; the hook-bones fairly prominent.....	7	.....
<b>Rump</b> .....	Long; broad; high; nearly level laterally; comparatively full above the thurl; carried out straight to dropping of tail.....	7	.....
<b>Thurl</b> .....	High; broad.....	4	.....
<b>Quarters</b> .....	Deep; broad; straight behind; wide and full at sides; open in the twist.....	5	.....
<b>Flanks</b> .....	Deep; full.....	2	.....
<b>Legs</b> .....	Comparatively short; clean and nearly straight; wide apart; firmly and squarely set under the body; arms wide, strong and tapering; feet of medium size, round, solid and deep..	5	.....
<b>Tail</b> .....	Large at base, the setting well back; tapering finely to switch; the end of bone reaching to hocks or below; the switch full.....	2	.....
<b>Hair and Handling</b> .....	Hair healthful in appearance; fine, soft and furry; skin of medium thickness and loose; mellow under the hand; the secretions oily, abundant and of a rich brown or yellow color.....	10	.....
<b>Mammary Veins</b> .....	Large; full; entering large orifices; double extension; with special development, such as forks, branches, connections, etc.....	10	.....
<b>Rudimentary Teats</b> .....	Large; well placed.....	2	.....
<b>Escutcheon</b> .....	Largest; finest.....	2	.....
	Perfection.....	100	.....
	Total discredit.....		.....
	Net score.....		.....

## SCORE CARD FOR HOLSTEIN-FRIESIAN COW

Parts	Description	Possible score	Dis-credits
<b>Head</b> .....	Decidedly feminine in appearance; fine in contour .....	2	.....
<b>Forehead</b> .....	Broad between the eyes; dishing.....	2	.....
<b>Face</b> .....	Of medium length; clean and trim, especially under the eyes, showing facial veins; the bridge of the nose straight .....	2	.....
<b>Muzzle</b> .....	Broad with strong lips.....	1	.....
<b>Ears</b> .....	Of medium size; of fine texture; the hair plentiful and soft; the secretions oily and abundant.....	1	.....
<b>Eyes</b> .....	Large; full; mild; bright.....	2	.....
<b>Horns</b> .....	Small; tapering finely towards the tips; set moderately narrow at base; oval; inclining forward; well bent inward; of fine texture; in appearance waxy.....	1	.....
<b>Neck</b> .....	Long; fine and clean at juncture with the head; free from dewlap; evenly and smoothly joined to shoulders...	4	.....
<b>Shoulders</b> .....	Slightly lower than the hips; fine and even over tops; moderately broad and full at sides.....	3	.....
<b>Chest</b> .....	Of moderate depth and lowness; smooth and moderately full in the brisket; full in the foreflanks [or through the heart] .....	6	.....
<b>Crops</b> .....	Moderately full .....	2	.....
<b>Chine</b> .....	Straight; strong; broadly developed, with open vertebrae.....	6	.....
<b>Barrel</b> .....	Long; of wedge shape; well rounded; with a large abdomen, trimly held up [in judging the last item age must be considered] .....	7	.....
<b>Loin and Hips</b> ..	Broad; level or nearly level between the hook-bones; level and strong laterally; spreading from chine broadly and nearly level; hook-bones fairly prominent .....	6	.....
<b>Rump</b> .....	Long; high; broad with roomy pelvis; nearly level laterally; comparatively full above the thurl; carried out straight to dropping of tail.....	6	.....
<b>Thurl</b> .....	High; broad .....	3	.....
<b>Quarters</b> .....	Deep; straight behind; twist filled with development of udder; wide and moderately full at the sides.....	4	.....
<b>Flanks</b> .....	Deep; comparatively full.....	2	.....
<b>Legs</b> .....	Comparatively short; clean and nearly straight; wide apart; firmly and squarely set under the body; feet of medium size, round, solid and deep..	4	.....
<b>Tail</b> .....	Large at base, the setting well back; tapering finely to switch; the end of the bone reaching to hocks or below; the switch full.....	2	.....
<b>Hair and Handling</b>	Hair healthful in appearance; fine, soft and furry; the skin of medium thickness and loose; mellow under the hand; the secretions oily, abundant and of a rich brown or yellow color .....	8	.....
<b>Mammary Veins</b> .....	Very large; very crooked [age must be taken into consideration in judging the size and crookedness]; entering very large or numerous orifices; double extension; with special developments, such as branches, connections, etc.....	10	.....
<b>Udder and Teats</b> .....	Very capacious; very flexible; quarters even; nearly filling the space in the rear below the twist, extending well forward in the front; broad and well held up .....	12	.....
<b>Teats</b> .....	Well formed; wide apart, plumb and of convenient size .....	2	.....
<b>Escutcheon</b> .....	Largest, finest .....	2	.....
	Perfection .....	100	.....
	Total discredit .....		.....
	Net score .....		.....



STATEMENT OF STUDENT IN COMPETITIVE JUDGING

Name ..... Date.....

Judging..... Class..... Section.....

First Place	Live Weight	Remarks .....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Second Place	Live Weight	Remarks .....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Third Place	Live Weight	Remarks .....
.....	.....	.....
.....	.....	.....
.....	.....	.....

## SCORE CARD FOR MILK.

Item.	Perfect Score	Score Allowed	Remarks.
Bacteria .....	35	.....	Bacteria found per cubic centimeter.....
Flavor and odor.....	25	.....	Flavor and odor.....
Visible dirt .....	10	.....	.....
Fat .....	10	.....	Per cent found.....
Solids not fat.....	10	.....	Per cent found.....
Acidity .....	5	.....	Per cent found.....
Bottle and cap.....	5	.....	Cap and bottle.....
<b>Total .....</b>	<b>100</b>	.....	

## DIRECTIONS FOR SCORING.

Bacteria Per Cubic Centimeter—Perfect Score, 35

	Points
Less than 400.....	35
400 to 700.....	34.5
700 to 1,000.....	34
1,000 to 2,000.....	33.5
2,000 to 3,000.....	33
Each additional 1,000 subtract 0.5.....	
9,000 to 10,000.....	29
10,000 to 15,000.....	28
15,000 to 20,000.....	27
Each additional 5,000 subtract 1.....	
100,000 to 110,000.....	10
110,000 to 120,000.....	9
Each additional 10,000 subtract 1.....	
200,000 and over.....	0

Note.—When the number of bacteria per cubic centimeter exceeds the local legal limit, the score shall be 0.

## FLAVOR AND ODOR—PERFECT SCORE, 25

Deductions for disagreeable odor or flavor should be made according to conditions found. When possible to recognize the cause of the difficulty it should be described under Remarks.

## VISIBLE DIRT—PERFECT SCORE, 10

Examination for visible dirt should be made only after the milk has stood for some time undisturbed in any way. Raise the bottle carefully in its natural, upright position, without tipping, until higher than the head. Observe the bottom of the milk with the naked eye, or by the aid of a reading glass. The presence of the slightest movable speck makes a perfect score impossible. Further deductions should be made according to the amount of dirt found. When possible the nature of the dirt should be described under Remarks.

FAT IN MILK—PERFECT SCORE, 10

	Points		Points
4.0 per cent and over.....	10	3.2 per cent.....	6
3.9 per cent.....	9.8	3.1 per cent.....	5
3.8 per cent.....	9.6	3.0 per cent.....	4
3.7 per cent.....	9.4	2.9 per cent.....	3
3.6 per cent.....	9.2	2.8 per cent.....	2
3.5 per cent.....	9	2.7 per cent.....	1
3.4 per cent.....	8	Less than 2.7 per cent.....	0
3.3 per cent.....	7		

Note.—When the per cent of fat is less than the local legal limit (3 per cent in Wisconsin) the score shall be 0.

SOLIDS NOT FAT—PERFECT SCORE, 10

	Points		Points
8.7 per cent and over.....	10	8.1 per cent.....	4
8.6 per cent.....	9	8.0 per cent.....	3
8.5 per cent.....	8	7.9 per cent.....	2
8.4 per cent.....	7	7.8 per cent.....	1
8.3 per cent.....	6	Less than 7.8 per cent.....	0
8.2 per cent.....	5		

Note.—When the per cent of solids not fat is less than the local legal limit the score shall be 0.

ACIDITY—PERFECT SCORE, 5

	Points		Points
Less than 0.2 per cent.....	5	0.22 per cent to 0.23 per cent.....	2
0.2 per cent to 0.21 per cent.....	4	0.23 per cent to 0.24 per cent.....	1
0.21 per cent to 0.22 per cent.....	3	0.24 per cent and over.....	0

BOTTLE AND CAP—PERFECT SCORE, 5

Bottles should be made of clear glass and free from attached metal parts. Caps should be sealed in their place with hot paraffin, or both cap and top of bottle covered with parchment paper or other protection against water and dirt. Deduct for tinted glass, attached metal parts, unprotected or leaky caps, partially filled bottles, or other conditions permitting contamination of milk or detracting from the appearance of the package.

WHEAT SCORE CARD

Scale of Points.	1	2	3	4	5
1. Trueness to type or breed characteristics.....					
2. Uniformity in size and shape of kernels.....					
3. Color of grain.....					
4. Freedom from mixture with other grain.....					
5. Size of kernel.....					
6. Freedom from weed seeds, dirt and other foreign material.....					
7. Freedom from damaged, smutty or musty kernels.....					
8. Weight per bushel.....					
9. Viability.....					
10. Hardness and texture.....					
<b>Total .....</b>					<b>100</b>

## OAT SCORE CARD

Scale of Points.	1	2	3	4	5
1. Trueness to type or breed characteristics.....	5				
2. Uniformity in size and shape of kernels.....	5				
3. Color of grains.....	15				
4. Mixture with other grains.....	10				
5. Size of kernel.....	10				
6. Freedom from weed seeds, dirt and other foreign material .....	10				
7. Odor-musty, smutty, sulphur.....	15				
8. Weight per bushel.....	15				
9. Percentage of meat to hull.....	5				
10. Viability .....	10				
Total .....	100				

## BARLEY SCORE CARD

Scale of Points.	1	2	3	4	5
1. Trueness to type or breed characteristics.....	5				
2. Uniformity in size and shape of kernels.....	5				
3. Color of grain.....	15				
4. Size of kernel.....	10				
5. Texture .....	10				
6. Freedom from mixture with other grains.....	10				
7. Freedom from weed seeds, dirt and other foreign material .....	10				
8. Freedom from damaged, smutty or musty kernels	10				
9. Weight per bushel.....	15				
10. Viability .....	10				
Total .....	100				

CORN SCORE CARD

Name and No. of Scorer.....

Sample No..... Date .....

Scale of Points.	1	2	3	4	5
1. Uniformity and trueness to type..... 10					
2. Shape of ear..... 10					
3. Color: a. Grain ..... 5					
b. Cob ..... 5					
4. Market condition ..... 10					
5. Tips ..... 5					
6. Butts ..... 5					
7. Kernels: a. Uniformity ..... 10					
b. Shape ..... 5					
8. Length of ear..... 10					
9. Circumference of ear..... 5					
10. Space: a. Furrow between rows..... 5					
b. Space between kernels at cob 5					
11. Percentage of corn..... 10					
Total .....100					

Reasons for student's score on test sample.

Numbers below refer to the various heads under which the sample of grain has been judged.

- 1 .....
- 2 .....
- 3 .....
- 4 .....
- 5 .....
- 6 .....
- 7 .....
- 8 .....
- 9 .....
- 10 .....
- 11 .....

SINGLE PLATE SCORE CARD FOR APPLES AND PEARS

Class.....

Sub-Class.....

	Perfection	Entries				
Form .....	15					
Size .....	15					
Color .....	20					
Uniformity .....	20					
Freedom from blemish.....	30					
<b>Total .....</b>	<b>100</b>					

Judge.....

Date.....

FRUIT COLLECTION SCORE CARD

Class.....

Sub-Class.....

	Perfection	Entries				
Number of varieties.....	30					
Adaptability of varieties for purpose stated .....	15					
Score of individual plates.....	45					
Taste in arrangement.....	10					
<b>Total .....</b>	<b>100</b>					

Judge.....

Date.....

FRUIT JUDGING

Variety.....

Place	Plate No.	Reasons
1st		
2nd		
3rd		
4th		
5th		
6th		

Date.....

Judge.....

POTATO JUDGING SCORE CARD

Name or Number of Exhibitor..... Score.....  
 Name or Number of Exhibitor..... Score .....

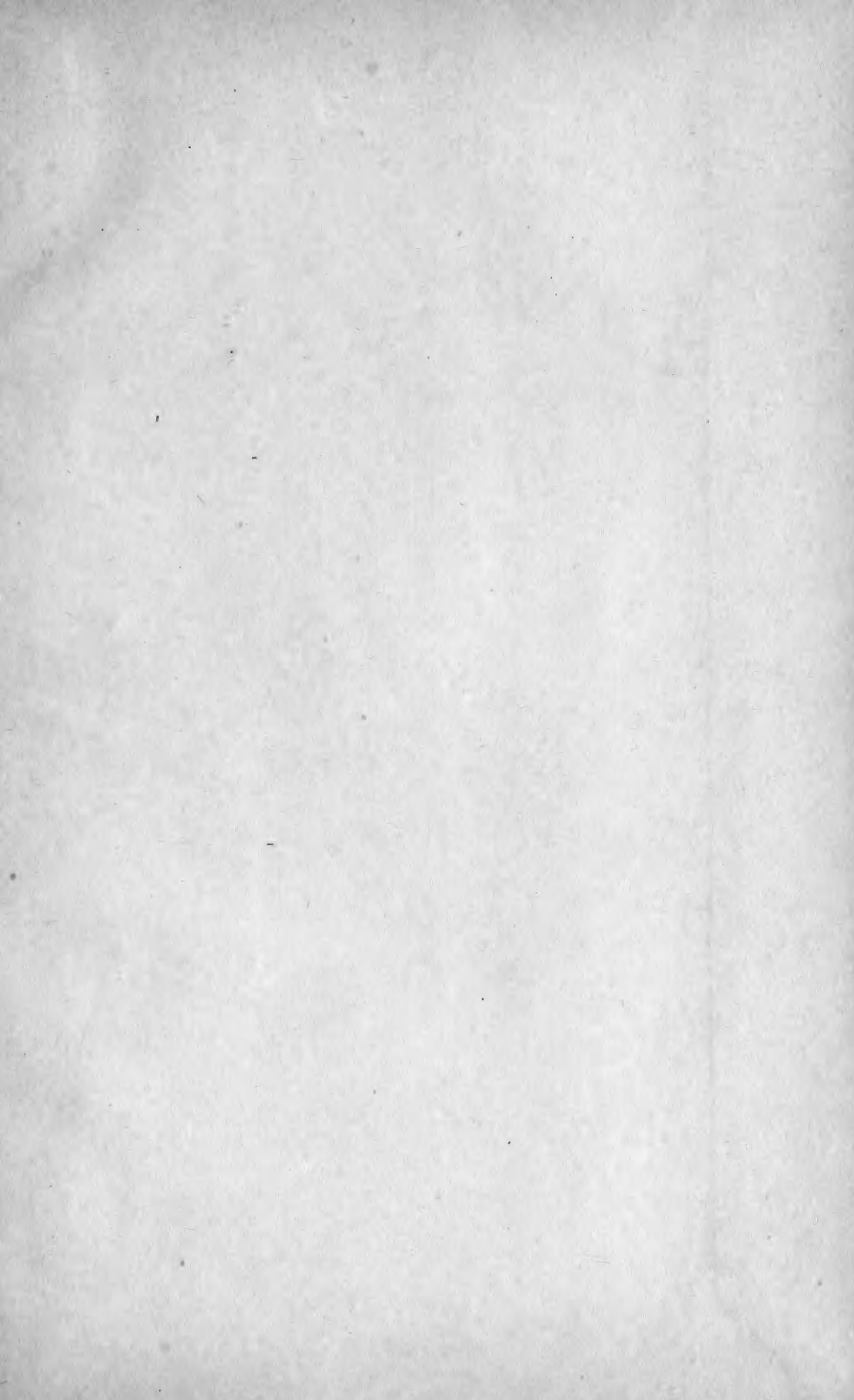
	Points Allowed	Score	Disqualifications	
<b>General Conformity to Type, 55 Points</b>				
Uniformity, shape, size, color.....	20	.....	All exhibits must be true to variety. A mixture of more than 5% will disqualify. On exhibits of 10 specimens, all tubers must be true to name or be disqualified.  Any exhibit showing specimens diseased with fusarium rot, scab, blackleg, wart disease, or any disease subject to spread through seed dissemination shall be disqualified.  Potato scab spots less than 1/2 inch in diameter shall not disqualify provided not more than 5% of the exhibit is infested. Any infestation of scab whatever shall cut the full ten points on the card.  Any exhibit which does not conform to specifications in size and neatness shall be disqualified at the discretion of the judge.	
Color: trueness to standard for variety .....	5	.....		
Shape: conformity to standard for variety .....	12	.....		
Size: desirability for commercial purposes .....	8	.....		
Eye characteristics: depth, distribution .....	10	.....		
<b>Market Conditions and Quality, 45 Points</b>				
Cleanness, brightness of skin, ripeness, freedom from sunburn, check or injury.....	20	.....		
Quality of flesh. (Examine for spongy, watery conditions, dark spots, hollow centers).....	10	.....		
Disease. See disqualifications. Examine for scab spots, dry-rot, etc. ....	10	.....		
Neatness .....	5	.....		
<b>Total</b> .....	<b>100</b>	.....		















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