

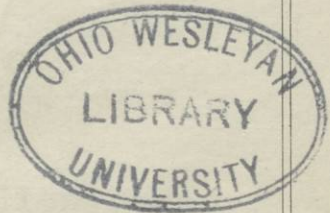
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DEPARTMENT OF THE INTERIOR
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AGRICULTURE IN SECONDARY SCHOOLS

A REPORT OF THE COMMISSION ON
THE REORGANIZATION OF SECOND-
ARY EDUCATION, APPOINTED BY THE
NATIONAL EDUCATION ASSOCIATION



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REPORTS OF THE COMMISSION ON THE REORGANIZATION OF SECONDARY EDUCATION.

The following reports of the commission have been issued as bulletins of the United States Bureau of Education and may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices stated. Lower prices will be quoted for quantities. Remittance should be made in coin or money order. Other reports of the commission are in preparation.

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¹ Deceased 1920.

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¹ Deceased Sept. 4, 1917.

PREFACE.

The Commission on the Reorganization of Secondary Education emphasizes vocation as one of the seven objectives of education and maintains that there should be a vital interrelation between education for vocation and education for the other objectives. In its report "Cardinal Principles of Secondary Education" (Bulletin No. 35 for 1918, United States Bureau of Education), the commission states:

This commission holds that education is essentially a unitary and continuous process, and that each of the objectives defined above must be recognized throughout the entire extent of secondary education. Furthermore, it is only as the pupil sees his vocation in relation to his citizenship and his citizenship in the light of his vocation that he will be prepared for effective membership in an industrial democracy. Consequently, this commission enters its protest against any and all plans, however well intended, which are in danger of divorcing vocation and social-civic education. It stands squarely for the infusion of vocation with the spirit of service and for the vitalization of culture by genuine contact with the world's work.

Agricultural curriculums in secondary schools, therefore, should be rich in social and civic content and at the same time contribute specifically to the vocational efficiency of many students. The future of agriculture is dependent not only upon increased knowledge of production but also upon the development of a more satisfying type of rural life.

The report which is contained in this bulletin has been approved by the committee on agriculture and by the reviewing committee of the commission. Approval by these committees does not commit every member individually to every statement and every implied educational doctrine, but does mean essential agreement as committees with the general recommendations.

CLARENCE D. KINGSLEY,
Chairman of the Commission.

AGRICULTURE IN SECONDARY SCHOOLS.

I. INTRODUCTION.

When the committee on agriculture was appointed, agricultural education in secondary schools was so new that opinions and practices varied greatly. During the period of investigation the thought and practice in this field have advanced rapidly. The various phases of vocational instruction, however, are not as yet well defined, and it may take a generation to determine the scope of work and the material essential in order to secure from such instruction the vocational results desired. In no other high-school subject, probably, is the teaching less uniform throughout the country than in agriculture. The nature of the subject prohibits rigidly standardized courses. There must be sufficient flexibility in agricultural instruction to adapt it to local conditions and needs; yet accompanying this flexibility there should be general uniformity in the sequence, nomenclature, and nature of the agricultural courses offered in high schools.

II. AIMS.

Agriculture in secondary schools comprises the elemental and basic portions of the science and art of agriculture found in the best farm practice, including crop production, live-stock raising, marketing, the conservation of soil fertility, and the proper equipping and operating of a farm as a business enterprise and as a place of abode. The scope of instruction described in this report covers the last six years of public-school courses of study. This plan is adopted because of the recent division of school work into the so-called "six-six" plan. Because of the several types of instruction necessary, the aims become threefold, viz, nonvocational, prevocational, and vocational.

Some school time should be devoted to the study of the most important industries of the locality, State, and Nation, largely for the informational value and apart from vocational motives. Since agriculture is the most fundamental of all industries and since the number engaged in agriculture is much greater than the number engaged in any other industry, the schools are justified in devoting some time to the nonvocational study of agriculture.

The prevocational aim is to introduce the growing child to the out-door world, to manual labor, and to the great field of science. This instruction should train the child in the simpler phases of farm practice and at the same time present to him the scientific wonders of the world immediately about him. This instruction should come in the seventh and eighth grades and should be of such a character that if the boy is unable to continue his studies in the high school, his training in agriculture will help him in his future farm work.

Vocational agricultural education is that education which :

- (1) gives the skill and knowledge necessary to the control of plant and animal production, to the end of economic profit, and
- (2) is so articulated with other education as to promote the most desirable farm community life.

It must be borne in mind that agriculture is more than a vocation ; it is a mode of life.

III. COURSES.

In the following outlines the committee attempts to state the aims, methods, and materials of courses in farm crops, horticulture, animal husbandry, poultry, farm engineering, and farm management which should form the essential parts of a four or six year sequence in agriculture. It is assumed that the students have had nature study (or elementary science), and in some cases, a course in essentials of agriculture before the end of the eighth grade.

Adaptation to local conditions.—It is not expected that all the subjects will be given in the order presented. The local school authorities should work out such an order of subjects as will fit local needs. Neither is it expected that a topic will be given equal emphasis in all districts. In adapting any order of subjects to local needs it may be necessary to expand one subject at expense of another.

Adaptation to students.—The material should be adapted to the needs and capacities of the students. Particular care should be taken with those topics dealing with the science underlying agricultural practice that the subject may be kept within the range of secondary students. For example, students may get a comprehension of how plants grow and the principles that underlie plant breeding without going into technical plant physiology and genetics. Likewise, as an aid to a better understanding of the practice of feeding, students should know the simpler aspects of digestion and assimilation, and understand the basis for scientific feeding. Yet preliminary lessons on these subjects need not involve anything beyond elementary chemistry and physiology. The extent to which those topics are considered will depend upon the students and their training in elementary science.

1. FARM CROPS.

Aim.—The specific aim of the work in farm crops is to enable young people to obtain such a knowledge of the characteristics, propagation, culture, improvement, storage, marketing, and use of the principal local field crops as will prepare them for success in field-crop farming.

Content and methods.—A detailed outline of the content of a course in farm crops would be of little or no value because of the wide variation in crops produced in different sections of the country. When the aim has been agreed upon, it determines, in a general way, the material that should go into the course; but the committee felt it wise to state specifically some of the factors that should be taken into consideration in selecting the topics for study and in determining the time emphasis that they should receive. Even a cursory examination of the work in the agricultural subjects in secondary schools will show a wide variation both in topics and in time-value given the topics. Such variations may be found in schools under essentially the same agricultural conditions. The present status is ample evidence that teachers have given too little thought to the subject.

The following are suggested as some factors which the agricultural instructor should take into consideration in selecting topics and in determining time emphasis:

(1) Local importance of the crop. In general, the most important local crop should be the one to receive the greatest amount of consideration. It should also have the most favorable opportunity for its consideration, e. g., if seasonal factors influence the conditions of its study, it should have the first consideration in time.

(2) The adaptability of the topic to secondary school conditions. Some crops, because of characteristics of growth, may serve better for study purposes than do some others. Among the grains, corn is an illustration of such a crop.

(3) The status of our knowledge with reference to certain subjects makes them poor topics for study by secondary school pupils. What should be done in connection with many topics is to teach the best accepted practice without going into consideration of details of experiments involving doubtful results.

(4) The importance of the crop within the State is a corollary to the first factor. Crops that require climate or soil conditions different from those to be found within the State should receive no consideration. For example, such crops as cotton, sugar cane, and citrus fruits should not be included in a course in agriculture in the Northern States.

(5) In the organization of subject matter, there is no high-school agricultural subject in which there is greater need for the recog-

dition of seasonal sequence. Seasonal organization gives opportunity for almost immediate application on the home farm, and the school has the interest of the home and community to reinforce its teachings. It also makes more available a supply of laboratory and illustrative material. These are desirable educationally, economically, and sociologically.

Use of illustrative material.—In addition to the material that may be collected locally each school should have a land laboratory in which illustrative and laboratory material may be raised. Even when the instructor is employed during the summer months, rarely is a school found that has an abundance of laboratory material. There are advantages in having certain growing crops near at hand for instructional purposes. This land laboratory does not need to be so large that the care of it will be a burden.

Correlation.—It is especially desirable to have a close correlation between farm crops and soils, because there are many phases of the two subjects that can be studied to the advantage of each if they are properly related.

Laboratory and field exercises.—Improvement in the technique of presentation is quite as desirable in farm crops as in other instruction, and it is hoped that the time is not far distant when definite professional training may be required of all secondary-school teachers of agriculture. The character of the instruction received by the teacher during his student days is a vital factor in determining how he teaches. One thing that needs especial consideration is greater unity between classroom instruction and laboratory exercises or field trips. The laboratory work in the college frequently has as its main purpose the development of technique and usually is quite independent of the lecture. As a result of seeing such courses run independently of each other, the teacher who is fresh from the college of agriculture is very likely to pursue a similar method. The committee believes that whether or not such separation is desirable in the college, there should be the closest possible relationship in the secondary schools. Careful planning is necessary to secure the desired unity.

Home projects.—The home project should be an integral part of the work in farm crops, and the completion of a minimum project should be required before credit is allowed for the course. The home project, or project on a farm where the student is employed, is indispensable in the successful teaching of farm crops. If the vocational purpose is to be realized, it is necessary to give the student an opportunity to apply through practice the knowledge gained through study. In general, the best place to try out this knowledge is the home farm, and a part of the study of every student should be devoted to planning projects carried out under the conditions found

at his home and to observing them closely as they develop. The home project has very decided advantages in testing his theory by application, in the demands which it makes upon the student's managerial ability, in its effect upon farm practice, and in its economy of operation.

Use of reference material.—Books should be used simply as a means of assistance in solving the problems presented by the project work, the home experience of the student, the laboratory, and the field trips.

2. ANIMAL HUSBANDRY.

Aims.—The specific aim of the work in animal husbandry is to enable young people to obtain such a knowledge of the characteristics, breeding, feeding, care, and management, and marketing of the domestic animals commonly raised for profit in that region as will prepare them for success in live-stock farming.

Content and methods.—The course in animal husbandry which will fit the needs of the majority of secondary schools is a general course of one unit. Such a course may cover in a general and fundamental way (1) the types and breeds of farm animals, (2) the care, feeding, and management of farm animals, (3) the improvement of farm animals, (4) milk and its products, (5) poultry, and (6) bees. The sequence of the topics, their relative importance, and the manner of treatment will depend to a great extent upon local conditions. Such a course furnishes a foundation for special courses which may follow and covers the general field in such a way that the student may readily use that which he has obtained if he goes no further.

If less than a full year is devoted to the subject, no attempt should be made to cover the whole field. A study of the types and breeds, general principles of breeding, care, feeding, and management should be developed as far as possible in their application to the groups of animals of greatest local importance. If more than one year is available for animal husbandry, special courses may be given relating to the groups which best fit the needs of the individual students. The two subjects which fill these requirements in the majority of cases are dairying and poultry husbandry. In the application of the vocational aim to either the general or the special subject ample time should be allowed for practical work.

Use of illustrative material.—The living animal should be given first place in concrete instruction. As a rule the school can not maintain any extensive herds or flocks. Therefore field trips to surrounding farms must be given a prominent place in this instruction.

Extensive use should be made also of pictures which may be obtained from farm journals. The use of original photographs should be encouraged, especially when used in the form of lantern

slides. Charts of many forms should also be used and may be reproduced to good advantage in lantern slides, on the blackboard, or on paper or cloth in permanent form.

Laboratory and field exercises.—A small portion of the secondary school course in animal husbandry is adapted to the usual laboratory methods. The greater part of such work given should be in practicums, i. e., exercises in which the principles considered in the class-room may be applied to practice and which have as their chief aim the acquiring of skill. Examples of practicums which may be carried on at school are the testing of eggs and the use of the Babcock test in determining the butter fat in milk.

For the greater part of the practicums in animal husbandry the farm should be used as the laboratory. Practice in stock judging, killing and dressing animals for meat, and treatment for pests and diseases must all be given where the animals are available. As in the study of the living animals, such practice means the use of animals on surrounding farms and the home farms of the students. Certain types of practice may be worked out best as individual assignments for home practicums. Examples of such exercises would include teaching a calf to drink, care and management of a setting hen, and training a colt to lead.

Home projects.—The following projects are suggestive of work which may be done on the home farm in connection with the course in animal husbandry:

- Care of calves on personal account.
- Care and feeding of one or more cows for one year.
- Developing a local milk or butter trade.
- Production of baby beef.
- Fattening cattle for the market.
- Developing swine for breeding.
- Feeding swine for pork production.
- Care of sheep on personal account.
- Care of sheep for share of increase.
- Care and management of poultry.
- Care of bees on personal account.

Use of reference material.—Inasmuch as the course of study should be adapted to meet the needs of the students and the community in which they live, the teacher can not hold to any one textbook. To supplement the text, abundant use should be made of bulletins, live-stock journals, and reference books. In adapting the course to meet the needs and interests of individual students, special study and reports should be required.

Equipment.—The teaching of animal husbandry is not dependent upon extensive or elaborate equipment at the school. A stereopticon with sets of slides showing types and breeds and equipment and methods of production will prove helpful, as will the charts, models,

and pictures suggested as illustrative material. A supply of score cards is needed for judging. The amount of equipment for dairying will depend upon the nature of the course given and the needs and resources of the school, but a Babcock testing outfit should be in every school teaching dairying. A hand separator and a hand churning outfit may usually be obtained with little expense.

2A. POULTRY.¹

Aim.—The specific aim of the work in poultry is to enable young people to obtain such a knowledge of the characteristics, breeding, feeding, care, and management, and marketing of farm poultry as will prepare them for successful poultry raising.

Content and methods.—1. Successful local poultry farms should be visited, or, if that is not possible, trips should be arranged to include some good plants.

2. Local poultry organizations should be established to go hand in hand with the instruction.

3. Breeds should be judged and scored, and exhibits held to stimulate interest and competition.

4. A careful study of type should be made, with all possible reference to exterior attributes as correlating with egg production and meat production.

5. Careful record of production should be kept on one or more pens, comparing either various types or breeds.

6. Selection of breeding pens emphasizing underlying principles, and based upon egg or meat production, should be practiced.

7. If the school possesses some poultry, a trap nest demonstration should be carried out by various members of the class taking charge in turn. A careful and accurate record may be kept of pullets laying earliest, and of size of the egg-litters. It is a superior method of comparing type with performance.

8. A thorough study of feeds should be made to acquaint students with appearance, quality, nutritive values, palatability, and economy. Figuring rations and mixing sample rations should be conducted.

9. Incubators and brooders should be studied and operated, young chickens reared, and records kept. Economy of various rations or methods of feeding should be shown here.

10. Study of egg structure and function of various parts should be made.

11. Candling, grading, and packing eggs; study of markets and best methods of shipping; use of parcel post, including best types of packages, should be given attention.

¹ While "poultry" is logically a part of "animal husbandry," it is given special treatment here because of its widespread occurrence, its adaptability to public school teaching, and the degree to which it differs from the other divisions of the main subject.

12. Killing, dressing, and packing poultry, and fattening demonstrations may be conducted by classes.

13. Study of poultry diseases and pests; and use of lice killers and preparation of sprays and washes should be included.

14. Reports on current poultry articles of practical value should be prepared.

Equipment and supplies.—The following materials provide necessary and convenient laboratory apparatus and suitable supplies:

1. Sample pens of a few important breeds, either owned by the school or borrowed.

2. Various types of poultry houses, portable or fixed; interior fixtures, such as water fountains, feed hoppers, troughs, water stands, grain-sprouting racks, and models of trap nests and fattening crates, many of which can be designed and constructed in wood-working shop at school or home.

3. Samples of various grains and mill-feeds with analyses and local prices.

4. Incubators and brooders, punches and rings for marking hatches.

5. Candling devices for studying eggs and testing fertility.

6. Young chicks for rearing and feeding work.

7. Poultry to kill, dress, and pack. Killing knives, blood cups, plumping forms, carting frames, etc.

8. Materials for lice killers and apparatus and materials for cleansing sprays and washes.

9. Samples of various parcel-post egg carriers and poultry containers.

10. Score cards and record blanks furnished by the state agricultural colleges.

11. Reference books and Government bulletins, also state bulletins on all previous topics.

3. SOILS.

Aim.—The specific aim of the work in soils is to enable young people to obtain such a knowledge of the most important principles of the formation, properties, and management of soils, applicable primarily to their own vicinity, as will prepare them for successful production of maximum crops and maintenance of soil fertility.

Content and methods.—The course in soils should attempt to acquaint the students with the following points:

1. Types of soils and their relation to plant growth.

2. Relation between soil texture and soil water.

Movement of water through the soil.

Capacity for holding water, etc.

3. Relation between color, temperature, and moisture in soils.

4. Methods of soil management and soil improvement by (a) drainage, (b) liming, (c) cultivation, (d) fertilization, (e) crop rotation.

This will require the use of both laboratory and field to supplement text study. Local conditions as to climate, weather conditions, etc., will in a measure control the amount and nature of the field work, but, as in all such work, it is essential that it be carefully planned and that all details be arranged in advance. Students should understand thoroughly the purpose of the trip and just what is expected of them. The observations made should be followed by classroom discussions and supplementary laboratory work. The use of lantern and slides when available will add much both to the value of the instruction and to the interest of the class, for the reason that it is impossible to see in a limited area and time many of the conditions and processes of soil formation which should be seen in order fully to understand the subject. Where the lantern method is unavailable, use should be made of post-card views, photographs, and magazine illustrations.

It is possible to do a considerable amount of work in soil physics and soil chemistry in secondary schools, the amount depending upon the equipment and time available and the age and advancement of the pupils. In most cases, however, it is better to attempt only the more elementary principles that have a direct bearing upon plant production, leaving the more scientific portions for later study.

Under ordinary conditions it is inadvisable to invest in expensive equipment for soil work. Much, if not all, that is needed, such as chimneys, boxes, and tin cans, can be provided or made by the pupils themselves. This affords an opportunity for correlation with the manual training departments. Often making apparatus will be of as much value as performing the exercise. This does not mean, however, that an excessive amount of time should be devoted to the making of apparatus.

In the selection of laboratory and field exercises local conditions should be considered. Many exercises, such as those dealing with capillary attraction, percolation, effect of mulches, etc., might easily find application anywhere; others will have only local importance.

Laboratory exercises.—The various manuals on soils contain outlines which may readily be adapted to local conditions. The following suggestive list of topics has a comparatively wide application and calls for a limited amount of equipment.

- (1) Water capacity of soils.
- (2) Effect of drainage on germination.
- (3) Effect of color on temperature.
- (4) Effect of lime.
- (5) Lime requirement of a given soil.

(Several methods are quite widely known. Consult your State Experiment Station as to the method to be used.)

- (6) Fertilizer tests.

4. HORTICULTURE.

Aim.—The specific aim of the work in horticulture is to enable young people to obtain such a knowledge of the characteristics, propagation, culture, improvement, harvesting, storage, marketing, and use of the principal local vegetable and fruit crops as will prepare them for success in vegetable and fruit raising.

Content and methods.—The field of horticulture is so rich in material that is interesting to high-school students and so valuable as training for a vocation or an avocation that it is difficult to determine what to teach during the year or half year usually allotted to this subject. The subject matter varies widely, according to climatic conditions, and the relative importance of the subject in different localities is an important factor in determining the choice of material. The high-school course in horticulture should include concrete work adapted to local conditions in each of the following general lines:

(a) PLANT PROPAGATION AND VEGETABLE GARDENING.

This should stress the home garden. Vegetables adapted to the local home gardens should be studied; also the preparation of seed-bed, seeding and transplanting, cultivation and harvesting, insects and diseases. In special truck regions market and truck gardening should be given due consideration.

(b) FRUIT GROWING.

This is a very comprehensive subject and should include methods of propagation, planting, cultivation, pruning, enemies and their control, harvesting, marketing, etc. Only those fruits should be selected that can be grown in the community.

The small fruits and orchard fruits adapted to the farm should receive chief emphasis, but commercial fruit growing should be studied in those communities adapted to the industry.

(c) IMPROVEMENT OF HOME GROUNDS.

This division of the subject should include a study of trees, shrubs, vines and flowers adapted to landscape use in the community (especially the native landscape material); the fundamental principles of choice and arrangement of material for landscape effect; the propagation and care of this material; the making and care of lawns; and planning and arrangement of driveways, fences, outbuildings, etc. Individual home grounds should be assigned for improvement plans.

Use of illustrative material.—Carefully selected and preserved materials should be kept to illustrate all points for which fresh material may not be available. Examples of such material are:

Insects showing stages in life history, samples of diseased fruits showing characteristic effects of disease, and representative samples of fruits and vegetables to show types and varieties. The various tools and implements suitable for use in the community, with the price of each and the address of the manufacturers, should be included in the equipment for illustrative use. Among these are pruning implements, spraying equipment, garden tools, budding knives. There should be lantern slides and photographs showing orchard management, landscape effects, methods of pruning trees, tomatoes, and grapes, containers for shipping horticultural products, etc. Such collections as vegetable seeds, nuts, and specimens showing effects of pests and diseases should be kept for use in the class. Charts of various kinds will be useful.

Correlations.—The subject matter of horticulture can be presented in a variety of sequences. The sequence as to the years in which the subject matter is taught is not so important as the seasonal sequence. Actual gardening should always be a part of the vegetable gardening course. Usually spring and summer are the ideal time for this work. Fruit growing and landscape work are adapted to every season, but winter and spring are especially desirable for study of these subjects.

The correlations of horticultural work with biology should be emphasized. The propagation of plants and the pruning of trees and shrubs may be closely correlated with botany, while the study of insects and methods of combating them may be correlated with zoology and entomology. There is an advantage if the biological sciences accompany or precede the work in horticulture.

Laboratory and field exercises.—The following general suggestions are given to guide in the selection of laboratory and field exercises:

1. Vegetable Gardening.

- (1) Plan and grow a demonstration home garden.
- (2) Construct hotbeds and cold frames.
- (3) Give practice in transplanting.
- (4) Study and use spraying materials and equipment.
- (5) Give practice in preparation and packing of vegetables for market.
- (6) Give practice in canning vegetables.
- (7) Give practice in harvesting and storing vegetables.

2. Fruit Growing.

- (1) Grow seedling apples, peaches, etc.
- (2) Propagate, by the best adapted method, each of the fruits adapted to the locality.
- (3) Give practice in planting, pruning, and spraying fruit trees and bushes.

- (4) Give practice in planting, pruning, training, and spraying grapes.
 - (5) Study different types of smudge pots.
 - (6) Study different fruits for types of containers for packing.
 - (7) Give practice in fruit grading, packing, and storing.
3. Improving Home Grounds.
- (1) Study excellent examples of landscape work in the community.
 - (2) Study landscape material adapted to the locality.
 - (3) Use lantern slides for good examples of materials and effects when community does not furnish examples.
 - (4) Study catalogues of landscape material.
 - (5) Give practice in propagating, planting, pruning, and care of ornamental bushes and trees.
 - (6) Give practice in managing hotbed and greenhouse.
 - (7) Plan individual home-ground planting.
 - (8) Make and execute design for ornamenting school grounds.

Home projects.—There are numerous valuable horticultural projects that can be carried on at home. Among them are: Vegetable gardening; growing tree fruits; growing small fruits, such as strawberries, raspberries, dewberries, currants, grapes; planning and planting of home grounds.

Use of reference material.—It is usually best to have the pupils buy books which include both vegetable gardening and fruit growing. The reference books and bulletins should be adequate for supplementary work. The bulletins from the local agricultural college and other agencies should be made use of to insure adaptation to local conditions. Catalogs of local nurseries will usually give valuable information on types and varieties of horticultural products and ornamentals adapted to the locality.

5. FARM ENGINEERING.

Aim.—The specific aim in the work of farm engineering is to prepare young people so to plan, locate, construct, and maintain farm buildings, fences, roads, and drainage (or irrigation) systems; and so to select, operate, and maintain farm machinery and mechanical equipment as to contribute most highly to the profit and pleasure of farming.

Content and methods.—A half-year course in rural engineering will meet the needs of most secondary schools, although a full year may be spent profitably upon the subject if the time is available and there is opportunity for a large amount of practical work. If but a half-year course is given it may be necessary to allow extra credit for projects. The course should cover in a general and fundamental way the following phases of the subject: (a) Farm machinery and

equipment and farm power, (b) farm structures, (c) farm sanitation, (d) agricultural surveying, (e) farm drainage, (f) irrigation, (g) roads. (See also following topics.)

Correlation.—Farm engineering may be taught as a special subject, or phases of the subject may be taught in an elementary manner in connection with other courses. It is recommended by the committee that farm engineering be taught as a separate subject in schools which give three or four years of agricultural instruction, have suitable equipment, and have a teacher with special training for the work. In case no special course is given, more attention should be given to simple phases of farm engineering in connection with other courses. Although farm engineering may be considered in a special course, there are phases of the subject which, if these subjects are to be made practical, are inseparable from other phases of agriculture. In such cases the more technical phases of the subject involving engineering problems should be reserved for the course in farm engineering or the work should be done by the two classes in cooperation.

Laboratory and field exercises.—In connection with this course the students should have practice at the school in as much of the following work as time and equipment will allow: (a) Setting up, use, and repair of farm motors and machinery, (b) concrete construction, (c) planning farm structures, (d) construction of minor farm buildings, (e) construction of fences, gates, and other farm equipment, (f) installation of water, sewerage, and lighting systems, (g) elementary surveying, (h) laying out drainage and irrigation systems, (i) construction and use of terrace level and road drag, (j) belt lapping, harness repair, making knots and splices, and such handicraft work as may fit the needs of the students and the community and has not been provided in earlier courses.

A survey of the community with regard to its sanitary conditions and needs, its roads, water supply, drainage, and irrigation needs will be of great benefit to the teacher and the class in connection with classroom work. It may also be made a basis for general community service along the lines most needed and in which the school is best able to serve.

Home projects.—Any of the lines of work suggested below may be either group projects carried on by the class or by a number of the students at the school or upon neighboring farms, or individual projects conducted upon the home farms:

Construction of farm buildings.

Laying out irrigation and drainage systems.

Road making and maintenance.

Equipment.—Schools owning a well-equipped farm have a distinct advantage in giving a course in rural engineering. There is a special

advantage where a school is improving its farm and equipment if the organization is such that the students may perform a large share of the work. On some school farms, which are highly successful from an educational point of view, the students, under competent supervision, erect the farm buildings, install all improvements, such as the water, sewage, heating, and lighting systems, set up and operate all new machinery and implements, and have the greater part of the care and repair of the equipment of the school as well as the school farm. Schools not having a farm should take advantage of the equipment and improvement needed at the school, on neighboring farms, and on the home farms of the students.

One of the most important features of equipment for rural engineering is a shop or workroom equipped for both woodworking and ironworking. Such a shop should have the tools and equipment essential to a well-managed farm. The farm equipment made, if it has not been made for a specific purpose at the school, should be such that the students may take it home and use it. As a rule, the making of models is not to be encouraged, when useful articles may be made. The home farms of the students and surrounding farms will furnish an abundance of equipment needing repair. Near-by implement dealers are often willing to furnish opportunity for study and practice in connection with farm machinery.

6. FARM MANAGEMENT.

Aim.—The specific aim of the work in farm management is to enable young people to obtain such a knowledge of sound principles and correct practices essential in the proper selection, organization, equipment, and operation of a farm as a business enterprise as will prepare them for financial success in farming.

Content and methods.—A half-year course in farm management will meet the needs of most secondary schools, although a full year may be spent profitably upon the subject if the time is available and there is opportunity for a large amount of practical work. The course should cover in a general and fundamental way the following phases of the subject: (*a*) Relation of farming as a business to other industries and to rural life, (*b*) opportunities in farming, (*c*) capital, credit, and land tenure in relation to agriculture, (*d*) types of farms and systems of farming, (*e*) planning and replanning the farm and farmstead, (*f*) farm equipment and improvements, (*g*) maintaining the fertility of the land, (*h*) cropping systems and crop management, (*i*) farm labor, (*j*) management of live stock, (*k*) farm records and accounts, (*l*) marketing farm products and (*m*) cooperation in agriculture.

Classroom instruction.—Although it will prove profitable to base the classroom instruction upon a textbook, the course should be

adapted to the special needs of the students and the community in which they live. Such adaptation and a general vitalization of classroom instruction may be had by: (a) Abundant use of reference material, (b) surveying local conditions, (c) use of illustrative material, (d) introduction of problems, (e) debates on live questions, and (f) connecting work of the classroom in a definite way with practical work.

Local surveys and field trips.—If the course in farm management is to be adapted to meet local needs, the instructor must know those needs definitely. He should have knowledge of the best of the local systems of farm management. To secure this knowledge it will be necessary for most teachers to make several definite but simple surveys of the local region. It is especially important to know conditions prevailing upon the home farms of the class members. In connection with the course in farm management, each of the students should later make an analysis of the home farm business, not only for the training that such a study gives in itself, but also to secure data to be used as a basis for further work in applying the principles of farm management to local conditions. Field trips for the purpose of making a first-hand study of farms and farming methods are valuable.

Use of illustrative material.—Illustrative material suitable to use in connection with farm management may be in the form of charts and maps for showing farm management and economic data in a graphic manner, and lantern slides and mounted pictures for showing the good and bad in farm management, as well as for showing farm plans and tabulated data.

Problems.—In connection with many of the lessons it will be profitable to give practice in working out arithmetical problems and problems which will involve reflective thinking as to methods of management and courses to pursue under given conditions.

Debates.—Some questions suggested will be debatable and will be of sufficient general importance and interest to call for a debate before the class. Such debates on well chosen subjects of local importance will do much to develop interest and promote investigation.

Practical work.—The work in farm records and accounts should involve a large amount of practice. Students who have had no bookkeeping will need practice in application of the elements of accounting to farm accounts. The analysis of the farm business, referred to above, may have given sufficient practice in making farm inventories; if not, inventory making should here be taught as essential to complete farm records and accounts. The keeping of records and accounts throughout a farming season may be considered a worthy project for a student in farm management. Blanks

for this can usually be obtained from the State College of Agriculture or the United States Department of Agriculture.

Wherever a student has opportunity to assume responsibility for the management of an extensive farm enterprise, such work should be credited as a farm-management project, if it is connected in a definite manner with the course given and meets the other requirements of a home project. In connection with problems of planning and replanning, practice should be given in making maps of farm plans. In studying how to choose a farm, practice should also be given in scoring. Practice should also be given in scoring and comparative judging of special features of farm management, such as proportion of live stock to field crops, crop-rotation systems, labor economies, etc.

Use of reference material.—It is desirable to use an elementary textbook and supplement it by more advanced references bearing on special phases of farm management and rural economics, and by bulletins and material from the agricultural press. State publications should be used to adapt the course to local needs. Special assignments should be made in adapting the instruction to the needs of individual students.

Equipment.—Inasmuch as the farms of the community will serve best for most of the laboratory work in farm management, comparatively little equipment is needed for teaching the subject. Such materials as are needed for classroom instruction and practical work may be grouped as follows: (a) Lantern slides,² charts, maps, and pictures, (b) a number of good books and a collection of bulletins pertaining to farm management, catalogued in such a manner that they will be readily available for reference use, (c) drawing material for making maps and plans, (d) books and blanks for practice in farm bookkeeping, (e) score cards and survey forms for study of farms.³

IV. HOME PROJECTS AND LOCAL EXTENSION WORK.

1. THE HOME PROJECT.

Agricultural resources.—Vocational agriculture requires the use of land and livestock. Some educators have held that secondary-school agriculture can not be made vocational unless the school operates a farm. Others have advocated that the school farm may well give way to the use of the home farm under the home-project plan. It is the opinion of this committee that all available resources should be used to give secondary-school agriculture greater educational value. In some sections and under some conditions school farms have been provided as the most practical solution of the problem. In other sections the home-project plan has established itself.

² It is assumed that the school has a stereopticon for general use.

³ Consult your State college of agriculture.

In still other sections both plans are used. In all cases teachers should make abundant use of surrounding farms.

*Essentials of a successful project.*⁴—A home project has been described as including each of the following requisites: (1) There must be a plan of work covering a season or an 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 correctly kept on suitable farms; and (7) a written report based on the record must be submitted to the teacher.

Classification of projects.—If a project is participated in by several students as a class, or portion of a class, it would be considered a *group project*, e. g., building a chicken house, or spraying an orchard. If the essential parts of the project are the work of one pupil it would be called an *individual project*, e. g., growing a vegetable garden. Individual home projects may be classed according to the chief aim as follows: (*a*) Productive projects—in which the chief aim is to produce any agricultural product at a profit. (*b*) Trial projects—in which the chief aim is to test materials and methods in agricultural practice new to the student. (*c*) Improvement projects—in which the chief aim is to make improvement regardless of immediate financial returns. (*d*) Management projects—in which the chief aim is to apply efficiently the general principles of farm management.

Connecting project study with project work.—Inasmuch as the projects must be adapted to the needs and resources of the individual students there must be some plan for individual study. Individual outlines have been used successfully as an aid in planning the work, and as a guide in the study of the subject. Such outlines may be prepared by supervisors and teachers or by students under the direction of their leaders. Definite references will aid the student materially in his project study.

There has been considerable discussion as to whether the project study shall precede or follow the project work. In some cases the agricultural instruction has followed the practical experience gained in the project; and in other cases the project has followed the instruction of the school. There is educational advantage in basing discussion of more or less abstract principles on the concrete experience obtained in the practical work. There is also sometimes economic advantage in a study of practical problems before they are

⁴ For fuller treatment see Federal Board for Vocational Education Bul. 21, Agric. Series No. 3, entitled "The Home Project as a Phase of Vocational Education," and U. S. Dept. of Agric. Bul. 346, "Home Projects in Secondary Courses in Agriculture."

worked out in projects. It is reasonable to assume that, as a rule, it is best to have the instruction and practical training run parallel and that every effort should be made to correlate principles and practice. A number of teachers have proved this assumption to be correct.

School credit for project work.—Credit should be given project work according to its educational value. Work of a technical nature involving new problems and the *acquiring of new skill continually throughout the project* may very well be given credit on the same basis as laboratory or field work. While the giving of school credit for practical work is a local administrative problem, the general rule above stated should hold. Rating of the project work should be given according to its merits. Work not reaching a certain grade should not be given credit.

Substitutes for home projects.—Resourceful teachers will take advantage of farms surrounding the school, not only for such class practicums as judging live stock and the pruning and spraying of trees, but also for more extensive individual projects. Work upon well-managed farms may be secured for students who do not live upon farms or who do not have opportunity for project work upon their home farms. A student in horticulture may secure work on a truck farm, a fruit farm, or in a greenhouse for a part of his time during the school year and during the summer months. Likewise a student in animal husbandry may secure work on a poultry farm, a dairy farm, or a general stock farm. When the farms are of a high standard and use modern methods and equipment, there is no doubt that such work will involve new experiences for the student who has no opportunity for such work at home. If the work is given supervision, if records and reports are required, and the work in other ways is connected definitely with the course the student is pursuing, it should have a decided educational value and should be credited as a substitute for a home project.

Use of the school farm.—School farms are most essential and have proven most successful where the majority of the students in agriculture are living at the school. The farms are used as a source of supply for school boarding houses, as a source of revenue, as a source of illustrative material for classroom and field instruction, as a means of demonstration to students and patrons, and as a means of training in practical farming. Although various means and methods have been worked out for the utilization of student labor on school farms there is great need of connecting the practical work of the farm more closely with the instruction of the classroom and laboratory and thus giving it greater educational value. Some schools have found that it is profitable from an educational point of view to give the students greater responsibility with respect to their farm work and to allow

them to participate in the results of their labors. This idea is essentially an application of the project plan to use of the school farm. The school farm projects may be grouped as follows: (a) Group projects, (b) individual projects.

Group projects.—There is excellent opportunity upon the school farm to develop group action and the cooperative spirit. Entire classes or groups of students who have similar interests and needs may be assigned projects in which they must work together. The following are examples of such projects which have been carried out successfully: (a) Erection of farm buildings, (b) installation of sewerage, lighting, and water systems, (c) planting and care of a model kitchen garden, a model orchard, or small fruit garden, and field plots for demonstration purposes, (d) care and management of a farm dairy or flock of poultry, or (e) renovating an old orchard.

There is also abundant opportunity for developing cooperation in connection with individual projects on the school farm. It is often more economical than would be separate action for students to combine their efforts in the preparation of the land, in the harvesting and marketing of crops and in other operations required to carry out their individual projects.

Individual projects.—The success of the home project plan has turned the attention of some agricultural schools toward the application of the plan to the work of the school farm. Individual students may be permitted to choose a project to carry out upon their own responsibility on the school farm. One student may have an acre devoted to corn or potatoes, another a half acre in garden truck, one student a flock of poultry, another one or more pigs. The students may be charged rent or interest on the land and equipment used and participate in either profit or loss on their projects. The general work of the farm may also be assigned to individual students. One student may be given charge of a team of horses and made responsible for their use and welfare, another given charge of the dairy barn and held responsible for the care of the cows and the milk and the records of feed consumed and milk produced. If such students are allowed to participate in profits or given some extra compensation it adds stimulus to better work.

One of the greatest problems in carrying out the project idea on the school farm arises from the fact that the students are not at the school throughout the year. It may be possible for students with animal projects, such as chickens or pigs, to take their animals home with them for the summer. In the case of such plant projects as field corn or potatoes it may be possible for the students to cooperate and employ one or more of their number to care for their crops during the summer. The problem varies with schools and different sections of the country and must be worked out according to local conditions.

2. LOCAL EXTENSION WORK.

With the coming of special teachers of agriculture into the rural high schools there has come a new conception of the function of such schools, a conception not bounded by narrow pedagogical dogmas. Through effective service it encompasses the whole community, the children in the school, the young people just out of school, the men and women on the farm, and the teachers and pupils in the neighboring elementary schools. The special teacher of vocational agriculture, usually from the State agricultural college, brings with him the agricultural extension ideas of that institution and much of the enthusiasm and spirit of public service of the extension workers.

Method of procedure.—While this enthusiasm is a very valuable asset, it is believed that before attempting extension work those responsible for conducting it should study the agriculture of the community to learn what is being done and what is worth while in each locality. He should know such things as the soil, the improvements, the transportation lines and the markets, the systems of farming followed, and the farmers themselves. Such information is fundamental to intelligent agricultural rural development.

The meaning of extension work.—The committee believes that it is proper for a public high school that is doing good work to extend itself to the people, but that it should not begin the process until it has something to extend. Not every high-school instructor in agriculture is qualified to do extension work. The instructor should first show in the teaching of his pupils that he is competent to extend his instruction to the patrons of the school. Extension efforts should be the result of work rather than the beginning of work. One is likely to make the mistake of beginning the extension work first, whereas the extension work should grow gradually as the school work in agriculture grows and be the natural expression among the people of the work that arises in the school itself.

Relationships.—All sorts of schemes are broached nowadays in the interests of better agriculture and country life. These need coordinating, but they can not be coordinated except on some basic principle. We have in agricultural extension work no more important problem than to try to determine in the next few years the groundwork on which may be based a correlation of labor that shall be both scientific and practically efficient with reference to the relationship of high-school extension in agriculture to other publicly supported agencies to Federal agencies, and the relationship of all to privately supported agencies. We must determine the way in which the community, the county, the State, and the Nation can cooperate in harmonizing and making effective as a great national movement the whole problem of agriculture and country life.

Classification of extension work.—It seems to be fairly well understood that work done either at school or away from school relating

to the training of pupils should be considered purely instructional in character. All such work as classroom instruction, laboratory exercises, school or home projects should be so considered.

Extension work, then, must be that which deals with those who are not in school. The committee finds that such activities on the part of the school group themselves under three heads, namely, direct, indirect, and incidental extension.

Direct extension would include well-planned activities. Such work should be done in close cooperation with the agricultural colleges and the United States Department of Agriculture, and may include such activities as (1) acting as organizer for the one-week short course for farmers, (2) offering personal counsel and advice on certain days to farmers of the community and assisting in the organizing of farmers' clubs, (3) assisting in organizing farmers' reading courses, (4) directing school agricultural exhibits locally and at the county fair, (5) meetings with farmers and farm visitation, (6) organizing and following up boys' and girls' clubs, (7) utilizing the local press in the discussion of local farm problems, and (8) utilizing the laboratory work of the pupils to promote improvement in the agricultural practices of the community by such work as testing seed corn, testing milk and cream, grafting, seed-purity testing.

Indirect extension would be the result of and grow out of the home project work with pupils. It is evident to the committee that many farmers would be influenced by the project demonstrations carried on at home in connection with classroom instruction.

Incidental extension.—It is reasonable to suppose that a trained agriculturist in any community would have propounded to him many questions in connection with the farmers' problems. These questions, of course, would be of a miscellaneous character and should be classed necessarily as incidental extension.

V. SCHOOL EXHIBITS.⁵

Purpose.—School fairs and exhibits are often held chiefly for the purpose of affording an opportunity for teachers and students to show parents and patrons what the school is doing. Although we may acknowledge that it is essential to arouse interest on the part of patrons and appreciate the value of exhibits in advertising the school, we should not lose sight of the value of such exhibits to the students themselves and to the young people of the community who are of school age.

Agricultural exhibits held in connection with home projects and other practical work of the school should have the following educational values: They should (1) arouse interest in practical agriculture and through it a general interest in the school; (2) establish

⁵ See U. S. Dept. of Agr., States Relations Service Doc. No. 42, "Agricultural Exhibits and Contests."

ideals toward which the students may work; (3) give practice to the students through preparation and arrangement; (4) furnish suitable materials for study and practice in judging; and (5) have a beneficial socializing influence associated with school spirit since they furnish opportunity for cooperation.

Types of exhibits.—Although the agricultural exhibit may be made a part of a general school fair, there are many cases in which the agricultural work of the students is such as to merit a special agricultural fair or exhibit. Various forms of agricultural exhibits may be made a part of the school museum and used as permanent teaching equipment. We are considering at this time, however, a temporary exhibit of the work of the students. This exhibit may cover all phases of agriculture, or it may deal with one line of school work or one kind of project. The following are examples of the latter class of exhibits which should be suggestive: (1) A corn show; (2) a poultry show; (3) a colt show; (4) a pig show; (5) potato, vegetable, and fruit exhibits; (6) exhibits of farm mechanics and handicraft work. If the practical work of the school or the home project work follows one or two special lines, it will be better to hold special exhibits of such work rather than attempt general ones.

Organization and plans.—It should be borne in mind that if the school exhibit is to represent the real work of the school and related home activities, it must be planned ahead. This is especially important in the case of farm products. The student should understand when he is planning his project and buying his seed in the spring that he is to make an exhibit of his products in the fall. The contest idea may well involve the whole project as well as the products exhibited. The exhibition of products may be made a requirement of the complete project, and a record of the project may be considered a part of the exhibit.

Early in the fall is the best time for a general exhibit in most parts of the country. This means that arrangements should be made soon after school begins. If there is a live agricultural club, a good part of the responsibility and credit for the work should be turned over to its members. Committees of three members should be appointed for each of the main divisions of the fair, the chairmen of these committees forming an executive board. The teacher may work through these student committees as ex officio chairman. As a means of making it a community affair, an advisory committee of men in the community should be invited to work with the students. These men should be especially helpful in assisting in the securing of premiums. If a permanent advisory committee aids in the supervising of the home projects, it should serve well in connection with the exhibit. One of the most able students should be appointed by the club as secretary of the school fair.

In order that students may know definitely what will be expected and what are the possibilities in their work, it is well to plan the exhibits and contests and secure prizes early in the season. The classification and grouping of exhibits will depend upon the nature and scope of the exhibit.

The exhibits should include, in addition to the products and results of the home work of the student, an exhibition of the agricultural work done at the school. Much of the latter work may be in the nature of practical demonstrations in modern methods. For example, some students may demonstrate the use of the Babcock test

for butter fat; others may show how to apply a simple acidity test for soils, or how to test seed corn; while others are explaining charts which represent agricultural surveys of the school district.

Preparation should be made in advance, so that all will be in readiness the day of the exhibit. The day may very well open with a parade in which the students take parts which have some significance as to their agricultural work. In some cases the parade may take the form of an agricultural or harvest pageant. This may be followed by an agricultural program. Part of the afternoon may be used in agricultural contests, as suggested below.

Contests.—The whole exhibit may represent more or less the contest idea in the products of school and home work. The agricultural contests suggested as a feature of the afternoon program represent training toward skill. They may be classed as group or team contests and contests among individuals. Teamwork should be encouraged because of its value in developing the social idea. Individual contests may be conducted with a view to selecting the winners as members of teams to represent a class or the school. It will be necessary to have junior and senior classes in most of the contests, if there is any great difference in the age and training of the contestants.

The judging contests may be grouped according to the method used, i. e., those involving the use of the score card and those involving the comparative method. The scoring of farm products and animals is better for the junior classes and for individual contests, while the use of the comparative method of placing according to merit is adapted to students who have had practice with score cards.

The following contests may be suggestive of others that will fit local needs and conditions:

1. Judging live stock, horses, cattle, sheep, hogs, poultry, and pet stock.
2. Judging farm products, grains, fruits, potatoes, and other vegetables.
3. Rope tying, 10 to 20 knots and splices.
4. Corn stringing and husking.
5. Fruit packing and boxmaking.
6. Naming of farm and garden seeds.
7. Identification of weeds and weed seeds.
8. Identification of common woods.
9. Riding, driving, and hitching of horses.
10. Killing and dressing of poultry.
11. A plowing match.

Awarding of prizes.—An effort should be made early in the season to secure prizes for the fair, so that the premium list may be published early. If a propaganda is started early and the people see that the school fair represents work which means much in building up the community, it ought not to be difficult to secure premiums. Cash premiums which are out of proportion to the work exhibited should not be given. It will be better to give recognition to a larger number of students. As a rule, it is easier to secure premiums other than cash. For example, in a community interested in poultry it is usually not difficult to get patrons of the school to give pure-bred fowls and settings of eggs as prizes to students for poultry projects and exhibits. Pure-bred pigs make excellent prizes for students in such projects as corn production, as they furnish a start for a new line of work. Books on agriculture and items of equipment are suitable premiums. Whenever there is but little cash it will be advisable to spend it for ribbons and pennants, rather than to lump it into one or two prizes. Larger amounts may be spent to good advantage as scholarships or payments on any college course in agriculture. Attendance at short courses given at the college and visits to fairs and other places of agricultural

interest have high educational value if properly planned and supervised, hence are valuable premiums for the projects and exhibits which represent considerable endeavor. Printed certificates may be used also as rewards, and should be given in connection with other premiums.

Rules for contests and standards for judging exhibits will depend upon local conditions. Such rules and standards should be made known to the contestants as early as possible. In most cases it will be best to have competent persons from outside the community to do the judging. The judging should be done as early in the day as possible, and the place won by the exhibit placed on the entry card for the benefit of those visiting the fair. The awarding of the prizes is suggested as the last number on the program as a means of keeping up interest to the last.

VI. USE OF REFERENCE MATERIAL.

1. FORM AND AMOUNT.

Books.—The number of books relating to agriculture is increasing very rapidly. There is need for the instructor in agriculture to use discrimination as to the material he places in the hands of his students. Although most of the books written for students of agriculture are intended primarily for the agricultural colleges, many of them are suitable for reference purposes in secondary schools. The teacher should make a careful selection of books for the school library considering them from the point of view of the student as well as the subject. It is better to have duplicate copies of a few usable books which are needed continually as references in connection with the course of study than to have the shelves of the library filled with complete sets, some volumes of which have no relation to the work of the students.

Bulletins.—Much excellent material for the use of schools is in bulletin form. Some of this material has not yet been organized into the general field covered by agricultural texts. The teacher will find bulletins very useful in making local applications of the general material of the textbook. Discrimination must be used, however, in the use of bulletins. Many of the experiment station bulletins of to-day are of a technical nature not suited to the use of secondary schools. The more general expository bulletins formerly published by the experiment stations are now, as a rule, published by the extension divisions of the agricultural colleges. So much of real value in teaching is now obtainable free of charge or at such a slight cost that there is little excuse for a school not having some kind of an agricultural library.

Periodicals.—Farm journals, like farm books, vary from the cheap general paper to the high-class paper covering a special field. There are one or two general farm papers which have a nation-wide circulation and a number of special live-stock and horticultural journals which should be received by schools teaching agriculture. The school should subscribe for the leading sectional and local farm papers to use in adapting the course of study to local conditions.

The better farm papers are indispensable in keeping both teacher and students abreast with agricultural progress. They are a fruitful source of good illustrations.

2. SOURCES.

The United States Department of Agriculture.—The Federal Department of Agriculture issues a great many publications useful to teachers of agriculture. The Farmers' Bulletins and Yearbooks, the most popular of its publications, may be obtained free through Members of Congress. The department supplies publications free to teachers as long as its supply lasts. From its Division of Agricultural Instruction may be obtained lists of the department publications prepared for the use of teachers. This division also maintains mailing lists of secondary schools teaching agriculture, to which its professional bulletins and other publications pertaining to agricultural instruction are sent.

The United States Department of the Interior: Bureau of Education.—The Federal Bureau of Education issues each year a number of bulletins relating to agricultural education and related subjects; it also issues A Monthly Record of Current Educational Publications.

Superintendent of Documents.—The Superintendent of Documents, Government Printing Office, Washington, D. C., issues price lists of public documents which he has for sale. These documents include those of the Department of Agriculture and the Bureau of Education. The following list gives the numbers of those lists which should be of interest to teachers of agriculture:

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|---------------------------------------|---------------------------------|
| 11. Foods and Diet. | 42. Experiment Stations Office. |
| 16. Farmers' Bulletins and Yearbooks. | 43. Forest Service. |
| 20. Lands. | 44. Plant Life. |
| 31. Education. | 45. Public Roads Office. |
| 38. Animal Industry. | 46. Soils. |
| 40. Chemistry Bureau. | 47. Crop Statistics. |
| 41. Insects. | 48. Weather Bureau. |

State agricultural colleges.—The State colleges of agriculture must be depended upon for most of the reference material and direct aid needed to adapt general courses of study and textbooks to local conditions. The publications of the extension divisions and the more popular expository circulars of the experiment stations will be found especially helpful to the students.

Other State institutions.—In some of the States the State universities, where they exist apart from the agricultural colleges, issue publications of interest to teachers of agriculture. Such material is also issued by State departments of education, boards of agriculture, horticulture, etc. Much of this material is in better form for use in secondary schools than experiment publications, yet it is often overlooked. The teacher of agriculture should make himself acquainted with all sources of aid and information

in his own State first of all, and then avail himself of the work of other States as far as possible.

Commercial institutions.—Many of the railroads, banks, and manufacturing concerns have departments of agricultural extension which issue publications and furnish illustrative material useful in agricultural instruction. The catalogues of the larger seed companies and nurseries are usually well illustrated, and may be used to advantage in a study of varieties. Likewise, catalogues of implements and farm machinery may be used in connection with farm mechanics. While discretion must be exercised in the use of advertising material, it may often be used to advantage.

Breeders' organizations.—Most of the associations which represent the different breeds of live stock publish circulars of value to the teaching of animal husbandry. They issue descriptive matter, charts, and score cards, which are of special value in a study of types and breeds. Lists of these associations, with the addresses of their secretaries, may be obtained from the Bureau of Animal Industry, United States Department of Agriculture.

3. EFFICIENCY IN USE.

As much of the material suggested may be obtained free of charge, the teacher should not only avail himself of it for the school but should also aim to arouse his students to collect such material as may have value in connection with their study and practice. Students may even be required to obtain such available bulletins as have a direct bearing upon their courses and projects. Lists of bulletins with instructions for obtaining them should be furnished early, so that no time will be lost in waiting for publications. For most reference reading students must depend upon the school library. Much of the best material is in the free publications, but in such a form that it is often overlooked. The teacher should use a card-index system,⁶ so that students may find the available information on any topic which may be assigned. Bulletins should be in suitable boxes and arranged on shelves according to the card-index system in use. Covers should be provided for bulletins which are used extensively. If files are not kept of the farm papers and important articles indexed, clippings should be made of such articles as may have a bearing upon subjects covered by the course of study. These clippings may be placed in large envelopes or letter files and indexed under title of subject with the bulletins. In making students acquainted with sources of information and establishing efficient habits in the use of that information much will be accomplished in their training.

⁶ See Federal Board for Vocational Education, Bul. 41, Agric. Series No. 3, entitled "Reference Material for Vocational Agricultural Instruction."