

AN OUTLINE FOR
AGRICULTURAL WORK IN THE
GRAMMAR-SCHOOL GRADES

BASED UPON

AN INTRODUCTION TO AGRICULTURE

BY

A. A. UPHAM



D. APPLETON AND COMPANY
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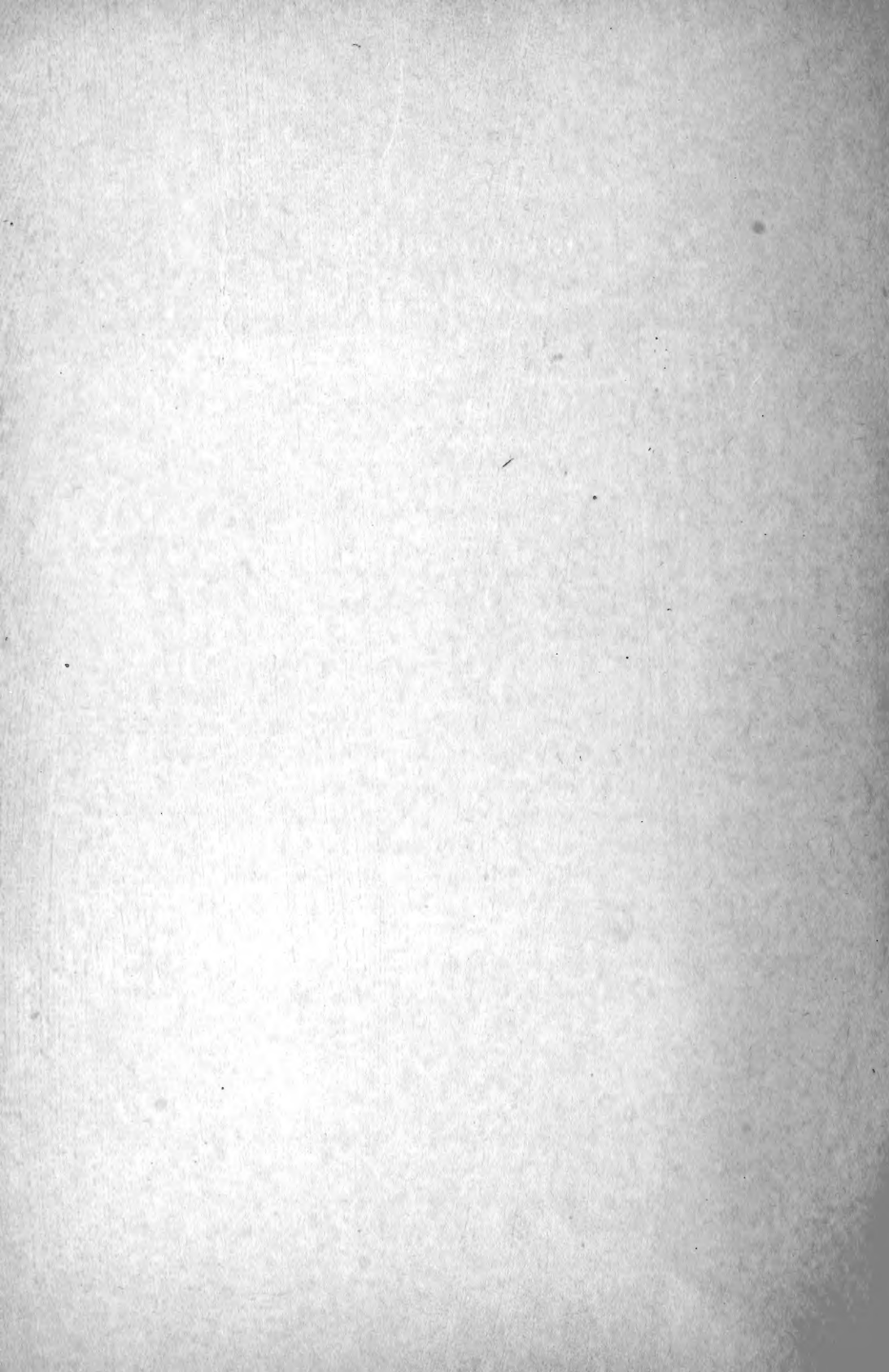
INTRODUCTION.

THERE has never been a time in the history of school work when the subject of Agriculture has received so much attention. Parents are demanding that their children be taught subjects which will be of benefit to them when they pass from the school; and that those things which are not practical be eliminated from the course of study.

Upham's text-book, *An Introduction to Agriculture*, has been prepared to meet this growing demand for the teaching of practical subjects; and this outline has been made to assist teachers in getting the best possible results from the use of that text.

The work for the whole year is planned. Much of it is based upon the text, but some must be taken from the numerous bulletins that are given as references. These bulletins may be obtained free from the Department of Agriculture, Washington, D. C., and from the various Experiment Stations.

However comprehensive this outline may be, it cannot be expected to teach the subject without assistance from the teacher. Careful preparation for every lesson is necessary to a presentation of the subject that will challenge the pupil's interest and attention.



PART ONE.

SOIL AND THE RELATION OF THE PLANT TO THE SOIL.

Pages 1 to 70 Inclusive.

CHAPTER I.

BEST results can be obtained by supplying each pupil with seeds in various stages of germination, and with the mature plant containing flowers and ripened seed pods. With the germinated seed in the hands of the pupil teach him the parts, as cotyledons, plumule, and hypocotyl.

Begin collection of fifty or more seeds of every farm crop grown in your neighborhood and of the seeds of twenty-five to forty of the worst weeds. Put in small bottles and label. (Children can perhaps supply discarded medicine bottles.) Where it is practical bring the whole weed before the class.

Why are these the worst weeds in the neighborhood?

In what way are weeds an injury to the farmer?

NOTE:—A good plan to follow is to have the class read the entire chapter as an oral reading lesson and then discuss the important points separately.

References: *Farmers' Bulletins*, Nos. 27, 28, 188, 279. Warren: *Elements of Agriculture*. Bailey: *Principles of Agriculture*.

CHAPTER II.

There is a great deal of confusion in the matter of distinguishing soils. Local terms are often misleading. For help see Warren's *Agriculture*, pages 76-79. Lead the pupils to see how the soil is formed. Discuss the effect of freezing. Refer

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to some common experience, such as the water freezing in a vessel. Discuss the work of earth worms.

What good does the soil do the plant?

Is your father's farm a rich farm? Why?

Make a collection of all the different soils in the neighborhood. Pulverize well and pick out all the sticks and stones or other foreign matter. Fill quart fruit jars, each with a different kind of soil, to within an inch of the top. Leave the covers off and set the jars where the soil will become very dry. When dry, weigh each very carefully and deduct the weight of the jar. Then add a little water at a time until each jar of soil has been given all it will contain. Weigh again to determine how much water each kind of soil will hold.

At this time or earlier teach the pupils how to bud a peach tree; how to care for a peach tree. See Upham's *Introduction to Agriculture*, p. 125; and Hodge's *Nature Study and Life*.

CHAPTER III.

Enlarge upon capillarity of soil and the need of soil drainage. Capillarity may be shown by the following experiments:

1. Place two pieces of block sugar, one on top of the other, in a saucer containing a small amount of red ink. Note results. The ink will rise to top of highest block.

2. Sew an old lamp wick to the end of a short wick that is in the common lamp. In sewing do not draw the two wicks together, but let the thread do the connecting. Reverse so that the dry wick is in the oil, and the moist wick is not in contact with oil, then light the lamp. Result: the lamp will refuse to burn after a short time because the capillary of the wick has been broken.

3. Hold two pieces of window glass or old photographic plates in such a manner that they touch at one edge, and are one eighth of an inch apart at the opposite edge. Place in water one set of ends that are at right angles with the edges that touch. The liquid rises between the plates highest where they are closest together.

These experiments may be performed by any teacher and may be used to bring out clearly the capillarity of the soil.

References: Warren: *Elements of Agriculture*, pp. 84–88, 91–94. Bailey: *Principles of Agriculture*, Chapter 5. *Farmers' Bulletins*, Nos. 187, 266.

CHAPTER IV.

This is one of the most important chapters in the book. Do not fail to bring out every point clearly. Explain thoroughly the object of the dust mulch. Be sure that the pupils understand the value of cultivating the soil often during dry weather.

Bolt two pieces of iron together with a piece of wood between them and allow them to become thoroughly soaked with water for a couple of hours, then put in a warm place to dry. The wood will shrink and be loose between the irons. Turn the nut again until it is tight and repeat the same operation of soaking and drying. The pupils will thus readily be made to see how farm machinery will decay and become useless by being left exposed to all kinds of weather.

Have the pupils make a list of all farm tools and machinery that they see exposed to the weather. Calculate the cost and determine what the farmers might save by being more careful.

References: *Farmers' Bulletins*, Nos. 226, 242, 278.

CHAPTER V.

In parts of the country where commercial fertilizers are extensively used, special time should be given to the study of the elements contained in them. Special attention should be given to the study of the sources and elements contained in plant foods. See Warren: *Elements of Agriculture*, Chapter 4.

Do not fail to bring out by special examples the great necessity of crop rotation. Perform the experiment of osmosis referred to on page 44 of Upham's *Introduction to Agriculture*. After the experiment has been performed, call attention to the relation of osmosis to plant growth.

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Teachers should read Chapter 6 of Warren's *Elements of Agriculture*. Parts of the chapter may be read to the class. The class should be required to solve practical problems on pages 52-53 of Upham.

References: *Farmers' Bulletins*, Nos. 44, 192, 222, 225, 342. Book on unmixed fertilizers that may be obtained from German Kali Works, Chicago.

CHAPTER VI.

A good exercise with which to begin this chapter would be to require the pupils to collect specimens of all the leguminous plants in the neighborhood. (For list, see key in any text-book of Botany.)

The pupils should be asked to dig up an entire clover plant and bring it to the class, and attention should be called to the large root system and tubercles. Do not pull the roots out of the soil or the tubercles will be stripped off. Remove the soil by washing.

Why is it necessary for the bumble bee to visit the clover fields before a crop of clover seed can be produced?

Should boys ever kill bumble bees? Why?

In order to secure a large crop of clover seed the farmer should not only protect the bumble bee, but he should provide nesting places for it. Cigar boxes can be used for this purpose. Make a hole, too small for the field mouse to enter, in the end of a box, then place an old mouse nest in it. Leave boxes like this near the barn, sheds, and clover field. In a short time the boxes will be occupied by queen bumble bees. The boxes may then be placed in the fence corner near the clover field out of the way. Farmers who follow this plan will be well paid for their trouble. The boxes should be placed early in the spring.

Lay particular stress upon the facts treated in paragraphs 42-43 of Upham. Obtain from the Agricultural Department, Washington, D. C., a pamphlet on "Nitrogen Fixing Bacteria," and then conduct the following experiment:

Fill two small boxes of the same size with the same kind of soil. Sterilize the soil. Plant the inoculated seeds in one and the uninoculated seeds in the other. Note the results.

References: *Farmers' Bulletins*, Nos. 237, 278, 245, 327, 342, 337, 144. Warren: *Elements of Agriculture*, Chapters 6 and 9.

CHAPTER VII.

The teacher should correlate this chapter with the physiology class work on foods. (See text-book in Physiology, chapter on Foods.)

Place fresh water algæ in a glass jar of water. Then set the jar in the sunshine and watch the gas (bubbles) rise. This gas is oxygen.

Read some good text-book of Botany for a full explanation of the process of photosynthesis.

Obtain five cents' worth of tincture of iodine from the drug-store and make tests for starch in potatoes, corn, wheat, beans, and rice.

Wood tissues in the carrot, parsnip, or potato can be shown by cutting a piece off the end and by placing the cut end in red ink for twenty-four hours. The course of the red ink shows the location of the wood fibers.

References: *Elementary Exercises in Agriculture*, Office of Experiment Station, Dept. of Agriculture, Washington, D. C. *Farmers' Bulletins*, Nos. 186 (pages 17-26), 85, 121, 128, 182, 275, 289, 293, 295, 298, 363.

HOME WORK FOR PART ONE.

Count all the different plants growing on a square foot of sod. Look very closely for those not readily seen. Also observe all animal life on the same square.

Find how much a horse will eat in a month and calculate what it will cost to keep him a year. Find out the ages of the horses on some farm, and calculate how much they have eaten in their lifetime and what it has cost to keep them. In this connection, refer to *Farmers' Bulletin*, No. 22.

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Find out what would be considered a good day's work (in acres) for one man at plowing with a breaking plow; cultivating corn; husking corn on stalk, in shock; cutting corn, wheat or oats with a binder; shocking wheat, oats; cutting corn; cutting hay; digging a ditch three feet deep for tile.

Make a list of all machinery on some farm and calculate the cost of each piece.

How many acres of wheat were grown on each farm in your district? How many bushels per acre did each farm yield? Make a list of all crops grown in the school district.

Where does the spavin grow on a horse? Sidebone? Splint? Curb? Thorough-pin? What does knee-sprung mean? Ask a horseman.

For what items is money paid out each year on the farm where you live?

PART TWO.

FARM FRIENDS AND FARM FOES.

Pages 71 to 159 Inclusive.

CHAPTER VIII.

BE sure that the pupils have a very clear idea of what weeds are, and teach them to recognize a few of the most important weeds in the neighborhood.

Discuss how weeds may spread from field to field. Spend some time discussing the best methods of destroying weeds.

Establish firmly in the pupil's mind the meaning of three terms: Annuals, Biennials and Perennials.

In the study of insects nothing can be more interesting than the study of the metamorphosis of some insects. The tomato worm would be a good example. The cabbage worm also can be easily raised in the schoolroom, and its change from worm to butterfly furnishes an extremely interesting lesson.

In the spring about the time apples begin to bloom secure a specimen of the codling moth. Watch its developments. Learn to identify it. Read what Hodge says about the codling moth in *Nature Study and Life*, page 181.

In connection with "Insect Control" a great deal of time should be spent in studying the latest publications on spraying.

References: Ohio Agricultural Experiment Station, Wooster, Ohio, *Bulletin*, No. 175. Michigan Agricultural Experiment Station, East Lansing, Mich., *Bulletin*, No. 260. North Dakota Experiment Station, Fargo, N. D., *Bulletins*, Nos. 56, 62, 80. *Farmers' Bulletins*, Nos. 17, 28, 99, 127, 132, 133, 155, 172, 188, 227, 231, 243, 281, 283, 284, 296, 305, 320, 334, 368. Bureau of Entomology, Washington, D. C., *Circulars*, Nos. 13, 59, 67, 69, 70, 71, 87, 113, 116, 119. New Hampshire Experiment Station, Durham, N. H., *Bulletins*, Nos. 39, 44. Virginia Experiment Station, Blacksburg, Va., *Bulletin*, No. 181.

CHAPTER IX.

The pupils should be required to make a list of all the birds they know. Establish a bird day and have the pupils put up a bird box. Encourage the children to build bird boxes at home.

A sparrow-proof box for the wren can be made from a deep cigar box. Nail down the lid and make a hole in the box not larger than a quarter. This hole is too small for the sparrow to enter but is large enough for the wren.

Find out what birds stay with us all winter, and what ones migrate. Keep a list with dates.

Inculcate love for birds, especially the quails, meadow larks, song sparrows, robins, wrens, woodpeckers, orioles, catbirds, martins, bluebirds.

The teacher should read what Hodge says about Toads, Chapter 16, *Nature Study and Life*.

Teach the children that there are some very useful insects.

References: *Farmers' Bulletins*, Nos. 54, 196, 309, 383, 443, 447, 474. Dept. of Agriculture, Washington, D. C., *Year*

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Book Reprints, Nos. 37, 66, 132, 194, 197, 247, 309, 322, 364, 443, 447, 474, 486. Biological Survey, Dept. of Agriculture, Washington, D. C., *Circulars*, Nos. 57, 61, 64.

CHAPTER X.

Review the study of the parts of the flower. Call special attention to the function of the essential parts. Examine the anthers and the stigma of a few fall flowers with a hand lens to see the pollen. Explain thoroughly plant pollination; the relation of insects to pollination.

Give a talk on Luther Burbank and read or tell his biography. A good biography of him may be found in W. S. Harwood's *New Creations in Plant Life*.

Too much time cannot be spent on the subjects of seed corn selection and of methods of storing corn. Urge the boys to practice what they learn.

The teacher should read some good material on plant breeding. See, for instance, Chapter 29, Bergen's *Essentials of Botany*, or Bailey's *Plant Breeding*.

There is such a wealth of directions and helps in the numerous bulletins on seed selection, testing, etc., that no further suggestions are necessary under this chapter. Read carefully the bulletins on seed selection and preservation and follow suggestions in proper seasons.

References: Experiment Station, Dept. of Agriculture, Washington, D. C., *Circular*, No. 96. *Farmers' Bulletins*, Nos. 81, 111, 157, 194, 199, 229, 253, 260, 272, 303, 313, 317, 366, 400, 404, 408, 414, 415. For the study of wheat, *Farmers' Bulletins*, Nos. 122, 210, 222, 237, 262, 273, 276.

CHAPTER XI.

Special reference has been made in this chapter to budding. If it is impossible for you to do field work have some branches brought to the schoolhouse and perform the experiments there.

In order to graft apples or pears the scions from the desired variety should be collected in the fall, labeled, and stored in a cellar in a box of damp sand.

If root grafting is to be done, the young apple trees should be collected in the fall and packed in the same manner as the scions.

Ask the pupils to make cuttings and layers at home and report their success in class.

References: *Farmers' Bulletins*, Nos. 113, 157, 213. Department of Agriculture, *Year Book Reprint*, No. 266. Warren: *Elements of Agriculture*, Chapter 3. Hodge: *Nature Study and Life*, pages 174-180.

CHAPTER XII.

Ask the pupils to make a list of every plant they grow in their gardens. They should also be required to make a plan of the garden showing the location of plants, and a tabulation of the value of the entire garden. In this way an interest in better gardens may be created.

Give directions for the planning of a garden and the selection of the most desirable plants to be grown. Note proper time for planting different seeds and methods of planting.

Have a school garden if possible.

References: *Farmers' Bulletins*, Nos. 39, 61, 129, 133, 134, 149, 185, 186, 198, 203, 210, 218, 220, 225, 231, 233, 248, 254, 255, 256, 259, 267, 273, 282, 289, 296, 324, 354, 359. Bureau of Entomology, Dept. of Agriculture, *Circulars*, Nos. 60, 62. Bailey: *Principles of Vegetable Gardening*. Fullerton: *How to Make a Vegetable Garden*.

A fine book on pure bred strawberries may be obtained by writing to E. R. Kellogg, Three Rivers, Mich.

A GOOD WAY TO CAN FRUIT.

About fifty years ago it was discovered that fruit and vegetables could be preserved, after they had been thoroughly heated,

by sealing them air tight in cans. By this process it is possible to have in winter many kinds of food that otherwise would not be available, such as berries, peaches, pears, apricots, etc.

The most important thing to be observed in this process is to have good, properly ripened fruit. No fruit is improved in canning, and the product will be inferior unless the fruit is carefully selected and prepared.

Be sure that the cans and their covers are sterilized by boiling and that covers and rubbers are free from defects. After placing the fruit in the cans seal the cans firmly while yet hot. Set the cans aside and allow them to cool for twenty-four hours or longer. This gives all the spores and possible living germs in the can an opportunity to germinate. Then tighten the covers more firmly, if possible, and place the cans, about a dozen at a time, in a wash boiler, being careful to place a wooden board in the bottom of the boiler to keep the bottom of the cans from direct heat. Fill the boiler almost to the covers of the cans with water. Raise to the boiling point. This kills all remaining germs. Take the cans out and allow them to cool, then wrap each can with newspaper to exclude the light, and set them away in a cool cellar or a cool dark place. When canned in this manner, it is reasonably certain that the fruit will not spoil, provided there are no defects in the cans.

CHAPTER XIII.

Make this chapter so practical and interesting that the farmer will realize the value of the school work.

Any wide-awake teacher can accomplish this end by making himself acquainted with the up-to-date ideas in farming. He should acquaint himself with the best recent literature on agriculture, and have in mind practical examples of successful application of modern ideas of farming. Find some farmer who has sprayed his trees, tested his seed corn, sprayed his potatoes, or treated his seed oats for smuts. Invite him to the school and ask him to give a talk to the pupils concerning his experience.

Get the bulletins to which reference is given and use them as the basis for class work. Do not be afraid to make assignments outside the regular text.

Pay especial attention to the teaching of the right methods and devices for raising the following crops: hay and grass crops, corn, clovers, wheat and other grains, potatoes and root crops. In the spring have the boys bring seed corn and test it as directed in the bulletin.

References: Warren: *Elements of Agriculture*, Chapters 7-9. *Farmers' Bulletins*—Corn, Nos. 81, 96, 199, 229, 253, 292, 303, 313, 317, 366, 400, 409, 414, 415; Wheat and Oats, Nos. 122, 210, 237, 262, 273, 276; Meadows, Pasture, Clovers, Nos. 66, 72, 102, 147, 260, 271, 312, 323, 337, 339; Potatoes, Nos. 35, 149, 244, 251, 407.

CHAPTER XIV.

No part of the farm is so often neglected as the orchard. It is a pity that the people in many parts of this country where fruits can be grown pay little or no attention to fruit growing. It is true that they plant trees, but what more can be said? Teach the children the possibilities of the home orchard. Teach them the best varieties of apples, pears, peaches, and all other kinds of fruits.

Show them where to plant and how to plant and care for the orchard.

Have the children make a list of all fruits they are acquainted with; then have them name the best varieties of each kind.

Send to the Superintendent of Documents, Union Building, Washington, D. C., for revised *Catalogue of Fruits Recommended for Cultivation in the Various Sections of the United States*, U. S. Department of Agriculture, Washington, 1899. Every teacher should have this book.

Find out what are the two best apples in the world.

Take the pupil to the orchard again and look for San José scale and codling moth, and, in this connection, teach the value of the birds.

Get Colonel Isaac W. Brown's book, *Birds That Work for Us*, Teachers' Journal, Marion, Ind.

The Colorado Experiment Station has given the following reasons for pruning:

1. Prune to modify the vigor of the tree, giving it less top to support, allowing the sap to flow into the remaining branches.
2. Prune to produce larger fruit than could be produced if the vital forces of the tree were divided among a greater number of branches.
3. Prune in summer to change the tree from wood-bearing to fruit-bearing.
4. Prune to give the desirable shape.
5. If the tree bears too heavily prune in winter so that the tendency will be to wood-growth.
6. Prune to remove surplus parts or injured parts, or parts that interfere with each other.
7. Prune to facilitate spraying or harvesting.
8. Prune to facilitate tillage.

Induce each boy and girl in the class to plant a fruit tree of some kind. Have them to understand that they are to own the tree and care for it in every detail.

Read the poem, "Planting of the Apple Tree," by William Cullen Bryant.

References: Peach—*Farmers' Bulletins*, Nos. 38, 54, 80, 208, 276, Dept. of Agriculture *Year Book Reprints*, Nos. 243, 386. Apple—*Farmers' Bulletins*, Nos. 42, 113, 114, 121, 124, 141, 154, 156, 161, 181, 197, 208, 233, 237, 243, 247, 261, 267, 281, 283, 401; Dept. of Agriculture *Year Book Reprints*, Nos. 266, 433, 452, 480, 514; Dept. of Agriculture, Bureau of Entomology, *Circulars*, Nos. 29, 32. Grapes—*Farmers' Bulletins*, Nos. 118, 156, 284, Dept. of Agriculture *Year Book Reprints*, Nos. 281, 354; Plum—*Farmers' Bulletin*, No. 73; Pear—*Farmers' Bulletin*, No. 50; Ornamental Trees—*Farmers' Bulletins*, Nos. 210, 260, 367, Dept. of Agriculture *Year Book Reprints*, No. 463. Bailey: *Principles of Fruit Growing*.

PART THREE.

FARM ANIMALS AND THEIR USES.

Pages 160 to 241 Inclusive.

CHAPTER XV.

THE main ideas to be brought out in this chapter are the characteristics of the two types of cattle—namely, the milk producer and the beef producer; the economic value of cattle to a farm as the consumers of grain, and the resulting fertility to the soil; the importance of having the best breeds on the farm, and lastly, how to improve the herd by breeding, proper feeding, and careful culling.

Study the pictures in the text to impress the two types of cattle on the minds of the pupil. If your school is near a farm where good cattle are kept, visit it with your class and ask the owner to talk on cattle, types, etc., with explanations and observations of the cattle.

Work out the questions and problems at the end of each chapter. Use bulletins as a basis for further class work on this important subject.

References: *Farmers' Bulletins*, Nos. 29, 42, 55, 63, 71, 73, 74, 106, 114, 124, 143, 149, 162, 166, 169, 183, 184, 190, 201, 206, 210, 227, 233, 241, 251, 273, 296, 350, 351. Warren: *Elements of Agriculture*, Chapter 12.

CHAPTER XVI.

Good work in physiology ought to be done with this chapter.

The building of a chart upon which may be placed all the products of the cow would be very interesting. For example: combs, cheese, butter, milk, glue, leather, buttons, bone fertilizer, etc.

Since milk is the principal food of children, help along the fight for pure milk by teaching the danger of infection from impure milk.

Explain the necessity of keeping the milk pails thoroughly cleansed. Also discuss the best type of milk pail for farm use.

Impress upon the minds of the pupils the facts that the stalls should always be very clean, and that in no case should the cow be milked until the udder is washed with a damp or wet rag.

Find out how many cows in the neighborhood have been tested for tuberculosis. Give the results of the tests.

EXPERIMENT.—To determine the effect of prompt cooling upon the souring of milk: Divide a sample of new milk into two parts; cool one by setting in ice water or cooler; after it is cooled place both samples in the same place and note which one sours first.

References: Lipman: *Bacteria in Relation to Country Life*, Chapter 12; Dept. of Agriculture *Circulars*, Nos. 11, 13, 20. *Farmers' Bulletins*, Nos. 29, 63, 73, 74, 131, 149, 166, 169, 201, 206, 210, 227, 241, 273, 280, 296, 337, 349, 351, 355, 363, 375, 413. Dept. of Agriculture, Bureau of Animal Industry, *Circulars*, Nos. 1, 56, 74, 118, 126, 127, 130, 142, 143, 152, 153, 158, 161. Dept. of Agriculture Experiment Station *Circulars*, (*Farmers' Institute Lecture*, No. 1). Dept. of Agriculture, *Year Book Reprints*, Nos. 94, 260.

CHAPTER XVII.

Much interest may be created by requiring the pupils to report on the history of the prehistoric horse. Refer them to the cyclopædia articles on "Horse, Evolution of the." It may interest the pupils to learn that at one time the horse had five toes on each foot, and finally through the course of evolution came to have but one.

Study the different types of horse and teach the pupils how they may recognize the best specimen of each—draft, roadster, coach, etc.

Require the pupils to reproduce the drawing of the horse and to learn the name of each part. Drill the class upon these terms until they become familiar.

Interest may be created in the class by having pupils tell of tricks taught the horse.

When a horse lies down, which end goes down first? How is it with cattle?

Observe horse and cattle in pasture and notice how each moves its head when biting off the grass. Explain the difference. Which bites the grass the shorter, horses or cattle?

Examine the front of the mouth of a cow and of a horse and write a description of each.

How much does a horse eat in a month, and how much does it cost? What will it cost to keep him a year?

Compare the skeleton of a man with that of a horse and find the parts that are similar.

Do you know that a horse has but one toe, and that that toe is his hoof? Compare the foot of a horse with that of a cow, hog, dog, cat, chicken.

Horses have greatly differing proportion of parts. Measure at least three horses of different size and of different breeds if possible, and compare the following: height of withers; length from muzzle to poll; from poll to withers; from withers to coupling; from coupling to setting on of tail; girth just back of shoulders; girth at flank; from point of shoulder to point of quarter; from point of shoulder to knee; from knee to fetlock; take the height at the withers as a base and compare in terms of per cent.

References: Dept. of Agriculture, Bureau of Animal Industry, *Circulars*, Nos. 37, 78, 87, 113, 137, 138, 163. *Farmers' Bulletins*, Nos. 22, 170, 179, 222, 316. Warren: *Elements of Agriculture*, Chapter 11.

CHAPTER XVIII.

SHEEP.

Impress upon the pupil the profit coming from keeping sheep on the farm, as well as the value of the service these animals render to the farm, not only in keeping down the weeds, underbrush and foulness of all kinds, but also in fertilizing the land.

Classify the different breeds of sheep and study the points

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of merit of each. See Warren: *Elements of Agriculture*, Chapter 13, for classifications.

Find out how many sheep are in your school district. Enumerate the different breeds and ask the farmers why they keep a certain kind.

Why do they not keep sheep in tropical countries?

Have you ever had a pet lamb?

Describe all uses of sheep.

How much does an average sheep weigh?

Where will the ticks go when the sheep are shorn?

What is meant by "dipping" sheep?

Why is it done, and how?

What is used as a dip?

References: *Farmers' Bulletins*, Nos. 49, 96, 119, 137, 159, 346. Dept. of Agriculture, Bureau of Animal Industry, *Circulars*, Nos. 81, 102, 157.

SWINE.

Discuss breeds; note merits and characteristics of each. What is the characteristic of the lard type of hogs? Of the bacon type? Average weight of each type? Study especially Poland, China, Duroc-Jersey, Chester White, Berkshire, Yorkshire, Hampshire, or Belted Swine. If any good representatives of the above named breeds are on a farm in the neighborhood it would be well to take the class to see them.

Take an inventory of all the live stock in the district as to kind, number, and value.

At what age is it most profitable to market hogs?

Write a description of some pure breed of swine treating of its size, color, history, and the advantages that are claimed for it.

Encourage boys to experiment in feeding hogs for market or home use to ascertain the best rations and how much it costs to market each hog. Does it pay better to fatten hogs with the corn or to sell the corn in the market? Have the boys estimate the advantage, if any, in feeding corn to hogs, over selling it.

References: *Farmers' Bulletins*, Nos. 22, 56, 84, 87, 92, 97,

100, 133, 144, 169, 205, 210, 222, 251, 272, 273, 296, 305, 315, 316, 329, 331, 334, 346, 379, 397. Dept. of Agriculture, Bureau of Animal Industry, *Circulars*, Nos. 17, 41, 63, 125, 126, 144. Office of the Secretary, Dept. of Agriculture, *Circular*, No. 30, (Hog Raising in the South.)

CHAPTER XIX.

POULTRY.

In spite of the fact that many farmers pay little or no attention to poultry culture, this branch of farming brings the largest revenue for the amount of money invested.

In 1899 the value of the poultry products was nearly equal to the combined value of all the iron, gold, silver, and coal that were mined during that year. This is exclusive of all the poultry products consumed on the farm. Here is an opportunity for the teacher to do some fine economic work for the farmers.

Induce the boys to get permission to feed the chickens on some good balanced ration and note the increase in egg yield. Keep records.

If possible, keep a small flock of hens at the schoolhouse. Feed them the scraps and use the eggs to buy supplies for the schoolroom. By all means lead the pupils to see that it is as important to raise pure bred poultry as thoroughbred cattle or horses. A pure bred hen is better in every way; she produces more eggs; gains more pounds in a given time; looks better and in fact is better in every respect.

Make blanks to keep record of poultry profits for one year. Write to prominent poultry men and ask them to tell you how much they get for some of their fancy chickens.

Induce the parents to give the pupils a part of the poultry profits for caring for the poultry. Place some good poultry books in the library.

References: *Farmers' Bulletins*, Nos. 51, 64, 84, 97, 103, 114, 122, 128, 144, 177, 182, 190, 200, 225, 227, 234, 236, 237, 244, 273, 276, 281, 287, 296, 305, 309, 316, 317, 353, 355, 357, 374, 381. Warren: *Elements of Agriculture*, Chapter 15. *American*

Standard of Perfection, Reliable Poultry Pub. Co., Quincy, Ill., (\$1.50.)

BEEES.

Little or no attention is paid to bee culture in many farming communities.

Bee keeping makes a fine combination with fruit growing and poultry culture. And it is highly important that bees be kept to insure complete pollination of the fruits which are insect pollinated.

Any schoolboy can, with very little expense and labor, earn several dollars with honey bees. Find out all you can about the following breeds: Carmolans, Caucasians, Italians, Cyprian, and Syrian. In Hodge's *Nature Study and Life* are very interesting descriptions of some of the above breeds of bees.

Ask the children to look for bees on the red clover blossoms. Find out why bees do not work on red clover. What kind of clover do they work on?

At noon intermissions try some experiments on living bees. Have some boy watch at the hive, if there is one near the schoolhouse, while members of the class sprinkle bees they find about the well or on flowers with flour and watch them go to the hive.

Ask some bee hunter to tell the class how he finds a bee tree.

Work all the problems at the end of the chapter.

Visit open flowers and notice bees at work. Observe how the long tongue is thrust deeply into the flower to sip the nectar. If the bee is gathering pollen see where it is placed. Does the bee carry the pollen away on the outside of the body? If so, where is it placed? On a warm day take the class to visit a beehive if there is one near the schoolhouse.

References: *Farmers' Bulletin*, No. 59. Dept. of Agriculture, Bureau of Entomology, *Circulars*, Nos. 70, 75, 92. Dept. of Agriculture, Bureau of Animal Industry, *Circulars*, Nos. 64, 128, 140. Dept. of Agriculture, Bureau of Chemistry, *Circular* No. 61. Dept. of Agriculture, *Year Book Reprint* No. 468. Comstock: *How to Keep Bees*. A, B, C and X, Y, Z of *Bee Culture*, A. I. Root Pub. Co., Medina, Ohio.

CHAPTER XX.

Farmers generally do not give much attention to composition, condition, and amount of feed given to various farm animals. There are many flocks of hens that are never fed anything from one year's end to another except corn. Ask the class how long they think they could live if they got nothing to eat but eggs. What is meant by balanced rations? Refer again to the text-book on Physiology for information on foods.

Find out how many of the boys in the class feed the hogs, and what and how they feed them. Ascertain whether any of them throw the corn into the mud in muddy weather. Study Tables 4, 5, 6 and 7 in the Appendix.

In connection with physiology work find out just how well the meals of the different pupils are balanced. Do this in such a way that sensitive pupils will not feel that you are prying into their private affairs. If the meals are not balanced tell them what they should eat. In this way you may find out why some of the members seem dull.

Call special attention to the story of the feeding of "Yeksa Sunbeam," page 216.

Study carefully the text of this chapter—it is very important.

References: *Farmers' Bulletins*, Nos. 22, 32, 36, 96, 100, 142, 151, 170, 186, 202, 222, 225, 233, 246, 251, 262, 276, 305, 316, 320, 329. Missouri Agricultural Experiment Station, *Bulletin* No. 58. North Carolina, No. 106. Louisiana, No. 114. Indiana, No. 131. New Jersey, No. 220. Mississippi, No. 120. Virginia, No. 182.

CHAPTER XXI.

The teacher should bring out in an orderly way all the facts of the chapter.

ROADS.

Give some time to the history of road making. Nothing could be made more interesting than a brief study of Roman methods of road building. Locate and give talks on the famous "Appian Way," and on Roman roads in France and England as well as the present-day roads in those countries. Informa-

tion on this subject may be found in any good cyclopædia. See New International Cyclopædia for excellent cuts and cross-section drawings of roads. Ask the children to reproduce drawings from the board. Make a careful study of these cross sections and of the nature of the materials used in road building. Study also road grading and draining. Ask the pupils to observe the roads in the school district and discuss with them the improvements that could and should be made. Arouse a sentiment among pupils for good roads.

Base your lesson plan upon the bulletins given for reference. Impress the essential ideas of road engineering in these lessons.

References: *Farmers' Bulletins*, Nos. 79, 95, 136, 321, 338. Dept. of Agriculture, *Year Books*, 1897, 1901.

FORESTRY.

Enlarge on the ideas given in the text with help from other sources. Bring out clearly the advantages of forests in regulating temperature, controlling flow of streams, and forming a reservoir of moisture during dry seasons. Learn what our government and other governments are doing in the matter of forest conservation.

Methods of caring for the forests are worth knowing.

References: *Farmers' Bulletins*, Nos. 10, 11, 13, 17, 76, 99, 114, 124, 134, 173, 210, 262, 276, 311, 321, 332, 338, 358, 360, 376, 423. Dept. of Agriculture, Bureau of Forestry, *Circulars*, Nos. 25, 30, 36, 55, 61, 97, 117, 130, 138, 140, 145, 157, 165, 166, 171, 176. Bergen: *Essentials of Botany*, chapter on Forestry.

HOME AND SCHOOL GROUNDS.

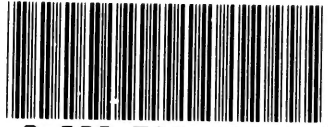
If the teacher will follow the many excellent suggestions given under topics 165, 166, 167 and 168 of the text it will be only a few years until every school ground in the country will be artistic and beautiful. Such grounds will afford the best evidence of progressiveness in our teachers. To know and not to do is to make of yourself a time server. Improve the school grounds. It will be a labor of love for both teacher and pupil.

References: *Farmers' Bulletins*, Nos. 134, 154, 195, 218.

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