LABORATORY, FIELD AND PROJECT GUIDE TO AGRICULTURE

G. A. SCHMIDT

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LABORATORY, FIELD AND PROJECT GUIDE

IN

ELEMENTARY AGRICULTURE

STUDYING AGRICULTURE IN THE RIGHT WAY.—*Courtesy International Harvester Co.*

LABORATORY, FIELD AND PROJECT GUIDE

IN

ELEMENTARY AGRICULTURE

BY

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TO THE TEACHER

Every sincere teacher of elementary agriculture is striving to make his teaching so practical that it will lead to worthwhile accomplishments. This means that he must not neglect laboratory, field, and project work. The purpose of this little book is to act as a practical guide to such teachers. All the exercises are arranged seasonally so that the various phases of the work may be studied at a time when they will mean most to a child.

The exercises in this book are intended primarily to cover two years' work. They are equally adaptable, however, to courses of shorter length where more time per week is allotted to the subject. In both cases, a teacher should consider the outline so elastic as not only to change the order of the exercises when she considers it wise to do so, but also to include others which she considers better fitted to the particular needs of the community in which she teaches.

In the book will be found enough material for laboratory, field, and project work to meet the requirements of most states. Throughout the book emphasis has been put upon those topics in which a child in the 7th, 8th, and 9th grades can take part.

The book should be used in connection with some good elementary argicultural text book. Although it is primarily adapted to use in conjunction with "An Introduction to Agriculture" by Upham and Schmidt, published by D. Appleton & Co., it can be used with any

of the more recent text books on elementary agriculture.

All the exercises in the book have been put to a practical test by several years' experience in the teaching and supervising of young people who were being fitted to teach in rural and state graded schools.

Every child in the class should possess a copy of the book, as all the directions throughout the exercises are given directly to him. Thus, much time and work are saved for the teacher in the planning, the directing, and the class room preparation for the work in agriculture; also, much time is saved for the pupil by simplifying the preparations of his outlines and notes.

Each teacher should make use of the exercises and projects best adapted to the community in which he teaches. The aim of the book is to help teachers in all communities to follow more intelligently the prescribed course of study, not to supplant or supplement it. Each teacher should, also, plan well in advance of the work of the class, for all the field trips and projects he intends the pupils to undertake.

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LABORATORY, FIELD AND PROJECT GUIDE

SEPTEMBER

Exercise 1

STUDY OF A POTATO PLANT

Object.—To make a careful study of a potato plant.

Material.—Each pupil in the class should carefully dig up a potato plant and bring it to school. The tops and roots should be intact and a few potatoes should be attached to the plant.

Procedure.—1. Carefully spread the plant out on a piece of newspaper and notice its parts—roots, stem, tubers, leaves, and flowers.

2. From what part of the plant do the tubers or potatoes grow?

3. Describe the size and shape of the potatoes. What is the color of the skin? Is the skin smooth, pimpled, or netted?

4. Are there few or many eyes? How are they distributed? Are the eyes deep or shallow?

5. Were the stems or vines upright or spreading? What is their color?

A HEALTHY BUSHEL.—*Courtesy Wisconsin Experiment Station*

6. Has the potato plant any flowers? Are they abundant? What is their color? Are the flowers essential to the formation of potatoes?

7. What variety of potatoes did you study? See Exercise 2.

8. If laboratory notes and drawings are kept, draw a tuber, natural size, showing the characteristics.

Questions

1. How do potatoes grow in size?
2. What is the composition of a potato?

3. How does the plant make starch and how does the starch get into the potato?

4. Are any of the potatoes diseased? With what disease?

Exercise 2

COMMON VARIETIES OF POTATOES

Object.—To become familiar with the characteristics of some of the common varieties of potatoes grown in the locality.

Materials.—Each pupil in the class should bring two good specimens of each variety of potatoes grown on the home farm.

Procedure.—1. The table given below shows the characteristics of some of the more common varieties of potatoes. The characteristics of the varieties common to the community should be learned.

VINE AND TUBER CHARACTERS OF STANDARD VARIETIES.

Variety	Tubers	Vines	Flowers
Rural New Yorker	Round, flattened, oval to oblong. Eyes unevenly placed. Blue to purple tipped sprouts.	Late variety. Purple tinged stems. Dark green foliage. Resistant to tip burn.	Bluish purple and fairly abundant.
Green Mountain	Blocky to oblong. Flattened. Skin netted. Firm. Creamy buff color. Sprout tips creamy green, pink at base.	Late variety. Stems green. Foliage bright green.	White and very abundant.
Burbank	Long-oblong and flattened. Pointed tubers objectionable. Eyes numerous, evenly distributed. Skin slightly netted.	Late variety. Light green color. Stems silver green and abundant.	White and fairly abundant.

Variety	Tubers	Vines	Flowers
Peerless (Pearl)	Heart shaped, stem end sunken. Flesh very white. Skin slightly netted.	Late variety. Medium dark green. Fairly bushy.	Very scarce, Seldom blooms. Buds yellowish white.
Triumph	Deep rose color. Round to flattened. Stem end sunken. Eyes numerous.	Fairly dark green. Leaves broad. Fairly bushy. Early variety.	Pale pink and purple tinged. Fairly abundant.
Early Ohio	Oval. Oblong and blocky. Skin pink, pimpled. Eyes prominent and numerous.	Fairly dark green. Stems dark green. Upright, bushy vine.	Scarce, yellowish white color.
Early Rose	Long and flattened. Light rose color, varying, eyes numerous. Sprouts yellowish green. Pink base.	Light to deep green. Thrifty.	Fairly abundant and white.
Irish Cobbler	Round to flattened. Fairly deep eyes. Pink tinge to sprouts. Skin creamy buff color.	Dark green and upright.	Fairly abundant and light pink color.

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2. If there are varieties of potatoes grown in the community, but not mentioned in the foregoing table, their characteristics may be learned by referring to seed catalogs.

3. Learn to identify each variety of potato at hand, by studying both the table showing the characteristics and the samples.

4. If scales are available, determine the weight in ounces of a fair representative of each variety of potato.

5. At the close of the exercise, mix up the potatoes and test your ability in naming each variety.

Questions

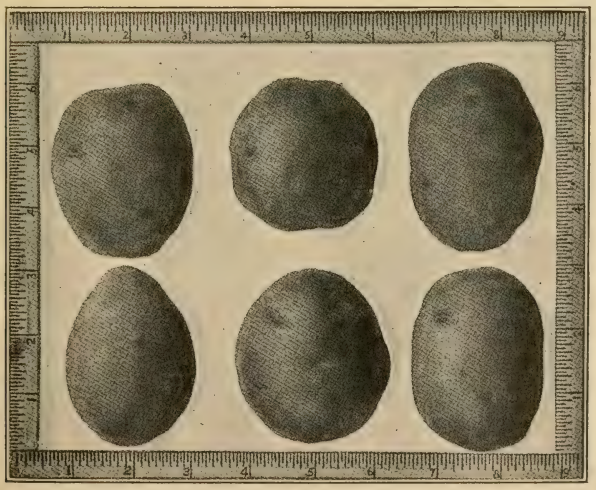
1. How many ounces does an average size potato weigh? How many potatoes should an average hill yield?
2. How many averaged sized potatoes are there in a bushel?

To the Teacher.—Inquire and find out what are the common varieties of potatoes grown in the community. Make an effort to have several good samples of each of these varieties on hand. If any of these varieties are not listed above, look up their characteristics in a seed catalog, or garden book, and write these characteristics on the board so that the pupils may copy them.

Exercise 3

A. Judging Potatoes

Object.—To practice judging potatoes by means of a score card.



TYPES THAT BRING TOP PRICES.—*Courtesy of Soil Improvement Committee, Chicago*

Materials.—Samples of standard varieties of potatoes grown in the community.

Procedure.—1. Review exercise 2, paying particular attention to the characteristics of the varieties of potatoes to be judged.

2. Score a sample of eight or ten potatoes of some one variety according to the score card here given.

SCORE CARD FOR POTATOES

Salient Points	Intrinsic Points	Perfect Score	Student's Score	Corrected Score
	1. Shape.....	25	.....	.....
	2. Size.....	20	.....	.....
	3. Color.....	10	.....	.....
	4. Eyes.....	10	.....	.....
	5. Flesh.....	10	.....	.....
	6. Blemishes.....	25	.....	.....
	Total.....	100		

In preparing the above score card the value of the potatoes for both "seed" and market was kept in mind. From the standpoint of "seed" alone the value of "shape" should be increased and the value of "blemishes" and possibly "size" decreased. The reverse would be true in judging from the market standpoint alone.

1. SHAPE

The form should be typical for the variety. It should show strong vitality. No signs of degeneration should be apparent. In varieties which are naturally long, such as the Burbank, thickness of tuber is an indication of vitality. In varieties like the Early Ohio, the short oval form is an indication of vitality. In varieties like Rural New Yorker No. 2, Sir Walter Raleigh, Carman No. 3, Carman No. 1, and Norcross, the tubers should be as nearly short as they are wide as practicable, and flattened. Varieties like Triumph and Irish Cobbler should be fully as short as they are wide, the former being slightly flattened and the latter more so. In no variety should there be any indications of tapering at either end. They should be uniform in shape. They should have as smooth and even a surface as possible. Knobs and other roughnesses of the surface are undesirable.

2. SIZE

The tubers should be of good size. Size indicates vitality and is desirable for market, but, on the other hand, they should not be too large. As a rule, people do not want extra large potatoes for kitchen use, and they are also not as desirable for seed when too large. They should be uniform in size.

3. COLOR

The color should be typical for the variety. It should be bright and attractive, but not obtained by scrubbing the potatoes. Where different varieties in a class of late potatoes are judged against each other the

white varieties should have preference over the red. In early varieties there is no objection to the color of the Ohio as compared with white varieties.

4. EYES

The eyes should be as shallow as practicable, and they should not be in a depression, because it makes the surface of the tubers uneven. The eyes should not be unduly numerous for the variety. An increase in the number of eyes above normal for the variety is one of the indications of degeneration.

5. FLESH

The flesh should be a clear white and free from grayish or dull hues, or dark colored streaks. There should be no hollowness, and a heavy cut should be made for this fault.

6. BLEMISHES

Scab is the most common blemish, and a heavy cut should be made for this fault, according to the amount present. The tubers should be free from all other diseases and injuries caused by insects, bruises or careless handling. They should also be in good marketing condition—mature, solid, not greened by exposure to light, not sprouted, and free from dirt.

It is preferable not to have them washed. They can be cleaned quite well with a soft cloth, taking care not to injure the skin by rubbing too hard. Some prefer washed potatoes because it improves the appearance of the exhibit. In case they are washed it should be done by simply rinsing them, without rubbing, until the dirt is removed. Scrubbing is exceedingly objectionable.

Sample No. .....Variety .....

Student's Name .....

3. Get the total or final score of the sample.

4. Discuss the results.

5. If time permits, score another sample.

6. Would the sample of potatoes you judged be of grade 1 or grade 2? See directions for grading given below.

B. Market Grades of Potatoes

The Department of Agriculture and the United States Food Administration jointly recommend and urge the adoption of the following grades, which, in their opinion, will meet the needs of the Federal Reserve Board, as well as those of growers, dealers, and consumers:

U. S. GRADE NO. 1.

This grade shall consist of sound potatoes of similar varietal characteristics, which are practically free from dirt or other foreign matter, frost, injury, sunburn, second growth, cuts, scab, blight, dry rot, and damage caused by disease, insects, or mechanical means. The minimum diameter of potatoes of the round varieties shall be one and seven-eighths (1⅞) inches, and of potatoes of the long varieties one and three-fourths (1¾) inches. In order to allow for variations incident to commercial grading and handling, five per centum by weight of any lot may be under the prescribed size, and, in addition, three per centum by weight of any such lot may be below the remaining requirements of this grade.

U. S. GRADE NO. 2.

This grade shall consist of potatoes of similar varietal characteristics, which are practically free from frost, injury and decay, and which are free from serious damage caused by dirt or other foreign matter, sunburn, second growth, cuts, scab, blight, dry rot, or other disease, insects, or mechanical means. The minimum diameter shall be one and one-half (1½) inches. In order to allow for variations incident to commercial grading and handling, five per centum by weight of any lot may be under the prescribed size, and, in addition, five per centum by weight of any such lot may be below the remaining requirements of this grade.

Reference.—F. B. 753: Commercial Handling, Grading, and Marketing of Potatoes.

Exercise 4

FALL WEEDS

Object.—To learn to know the names and characteristics of the common weeds of the community.

Explanation.—There are two ways in which this exercise may be taken up. One is to have each pupil in the class bring to school weeds found on the way. These weeds should then be studied in the class room. The other and the better way is for the class to go out on a field trip. Each member of the class should be supplied with an old magazine and a lead pencil.

Procedure.—1. Learn the name of each weed brought into the class room. Ask your teacher the names of those you do not know. If a weed cannot be named, it should be put aside and identified later. Insert a piece of each weed if large, or a whole specimen if small, between two

pages of the magazine and write the name of the weed at the top of one of the pages.

2. Discuss the characteristics of each weed by answering the following questions: Is it an annual? Where does it commonly grow?

3. In this manner all the weeds should be taken up. List the weeds identified and opposite their names write one or two of their characteristics.

4. If weeds are studied on a field trip, each weed should be discussed as mentioned above, and each member of the class should have a sample of each weed.

5. In storing the weeds in the old magazine, leave a number of unoccupied pages after the place of insertion of each weed. In this way the weeds will be kept in good condition. Press them by putting several heavy books on top of the magazine. In about a week the pressed weeds should be dry enough to mount if you wish to make a collection. They may be kept, indefinitely, in the magazine.

6. Occasionally test your ability to name the weeds. Cover the name, look at each weed, and see if you can name it and give its characteristics. If you have forgotten these, refer to the list.

7. You should have no trouble in finding from 25 to 50 varieties of weeds in your community if several field trips are taken, and this number will, without doubt, contain all the common ones.

8. If time permits, collect samples of common weed seeds. Put these in small vials or envelopes 1½″ x 2″ and learn to recognize them.

Questions

1. What weeds are most common in the community?
2. What are the worst weeds in the community?
3. Why are some weeds harder to hold in check than others?

To the Teacher.—This exercise succeeds best when the work is done collectively by the class, the teacher holding before the class a specimen of each weed, and following the outline suggested.

Exercise 5

SELECTING SEED CORN

Object.—To learn how to select, in the field, good ears of corn for seed.

Explanation.—The moisture content of corn is often 30% or more when the seed is ready to pick. If freezing weather catches the seed ears when they contain a relatively high percentage of water, the corn is likely to be of no value for seed purposes. To get good seed the seed ears must be selected before frost and from the plants in the field, and the ears must then be properly stored. The following points should be observed in selecting seed corn from the field:

RURAL STUDENTS SELECTING SEED CORN.—*Courtesy Iowa State Teachers' College*

1. The ears should be of good shape, but early maturity must not be sacrificed for fancy points.

2. Ears of medium size only should be chosen.

3. Ears should be chosen which hang down, because they shed water.

4. The kernels should be well dented.

5. There should be two good stalks in the hill from which a seed ear is taken, if the corn was planted in hills.

6. Do not, in the field, be too particular about the fancy points. Study the corn more carefully after you have selected a considerable quantity.

Materials.—A field of corn from which seed ears may be selected, and a few good specimens of ears of corn fit for seed.

Procedure.—1. Carefully read the explanation, and listen to your teacher's discussion.

2. Get a good, clear idea of the kind of corn that should be selected.

3. When in the corn field be careful not to destroy any of the corn. Select a row and proceed to gather a few good ears from it.

4. Place the ears of corn you have selected in a row with those which the other members of the class have selected.

5. How do the ears you have selected compare with the others? Would they make good seed corn?

6. Give the corn you selected to the owner of the field.

Questions

1. Why is it preferable to buy seed corn on the ear rather than shelled seed corn?

2. Why is field selection better than crib selection?

To the Teacher.—Obtain from some farmer in the community a few good ears of seed corn of a variety commonly grown. Briefly discuss with the class characteristics of good seed corn, before you take the class out. See Exercise 5, December. Obtain permission from a neighboring farmer to select with the class some seed corn. Try to get him to assist and take part in the discussion after the class has selected some corn.

Exercise 6

CURING AND STORING SEED CORN

Object.—To study different methods of curing and storing seed corn.

Explanation.—The germinating power of seed corn and the stand of corn in the field depend largely upon the way the seed corn has been cured. This is illustrated by the data given below, taken from the Wisconsin Agricultural Experiment Station, Circular 58.

STORAGE, GERMINATION AND STAND TESTS OF SEED CORN USED BY 350 WISCONSIN FARMERS.

Methods of Storage	Germination			Average stands 1909–1910	Number of Tests
	1909	1910	Average		
1. Kiln dried	93	90	91.5	89	16
2. Furnace room	93	89	91.0	..	8
3. Room above kitchen	92	81	86.5	81	112
4. Attics	92	77	84.5	79	75
Average	92.5	84.2	88.3	83	211
5. Under porches	79	62	70.5	63	27
6. Granaries	65	43	54.0	77	20
7. Barns, tool houses and other out-buildings	86	52	69.0	60	52
8. Corn cribs	38	37	37.5	49	26
9. In shock during winter	81	1.5	41.2	41	4
10. Windmills and outside of walls of buildings	45	23	34.0	56	10
Average	65.6	36.4	51.0	57.5	139

Seed corn at harvest time contains much water and the corn should, therefore, be hung up or stored in some

PROJECT WORKERS CURING THEIR SEED CORN FOR NEXT YEAR'S CROP.—*Courtesy U. S. Department of Agriculture*

way in which it may cure quickly. While curing, it should be protected from freezing temperatures and the

hot sun, but should be in a place where there is a good circulation of air.

Materials.—Binder twine, wire corn hangers, and ears of corn.

Procedure.—1. Enumerate some good places in which to cure seed corn. What are the characteristics of a good curing place?

2. Practice stringing corn, and putting corn on hangers.

3. Visit some places where corn is being properly cured and where it is well stored for the winter.

Questions

1. Why cure seed corn where there is a good circulation of air?

2. Where have you seen farmers cure their seed corn? Were these good or poor places? Why?

Exercise 7

CUTTINGS FROM FLOWERING PLANTS

Object.—To make and root cuttings from such plants as the geranium, the coleus, and the wandering Jew.

Materials.—Plants from which cuttings are to be made; a sharp knife; flower pots; clean, coarse sand; and several glasses.

Procedure.—1. From the ends of fairly well matured branches of geranium, coleus, or wandering Jew plants, cut off pieces 3 to 4 inches long. Make the cuts about ⅛ of an inch below the nodes, or joints. Cut off the lower leaves from the cuttings and if the upper leaves are large, cut off about ½ of each leaf. This will leave on the cuttings only a few small leaves.

2. Place the cutting so deeply into clean, sharp sand that merely a little of the top and a few remaining leaves show.

3. Keep the pots in a moderately warm room, and water the cuttings often to keep the sand moist. Shade the plants from the direct sunlight.

A GERANIUM CUTTING READY FOR PLANTING.—*Courtesy H. Sahli, Whitewater, Wis.*

4. Try rooting some of the cuttings in a glass of water. Change the water frequently to keep it fresh.

5. After the roots are well started, pot the plants in good, rich garden soil containing a little coarse sand.

Questions

1. Why root the cuttings in sand?
2. Why protect the cuttings from direct sunlight?

To the Teacher.—Unless plants from which cuttings can be made are easily available, it would not pay to take up this exercise. The rooted cuttings make desirable plants for the school room and for the home, and it is for this reason that this exercise is here given.

Exercise 8

DIGESTIBLE NUTRIENTS IN COMMON FEEDS

Object.—To determine the total amount of digestible nutrients in 100 pounds of common feeds.

Explanation.—The three important nutrients in feeds are protein, carbohydrates, and fat. In addition to these we find mineral matter and water. The weight of any feed, less the weight of water it contains, gives the weight of the dry matter.

Fat produces 2¼ times as much heat and energy as an equal amount of protein or carbohydrates. In finding out the total amounts of digestible nutrients in feeds, it is necessary, therefore, to multiply the amount of fat by 2¼ to reduce it to carbohydrate and protein equivalents, so that the three may be added together.

Procedure.—1. Find the total amount of digestible nutrients in the following feeds. Multiply the fat by 2.25 and add the result to the amount of digestible carbohydrates and protein, as illustrated with corn. If the third decimal is less than 5, drop it; if 5 or more than 5, add one to the second decimal.

2. Below are given the calculations for finding the total amount of digestible nutrients in 100 lbs. of shelled corn.

LBS. OF DIGESTIBLE NUTRIENTS IN 100 LBS. OF CORN

Protein	Carbohydrates	Fat
7.8	66.8	4.3

$4.3 \times 2.25 = 9.68$
$7.8 + 66.8 + 9.68 = 84.28$, total digestible nutrients.

3. Make similar calculations for all the feeds mentioned in the following table and record the results in the last column.

TOTAL AMOUNT OF DIGESTIBLE NUTRIENTS IN 100 POUNDS

Feeding Stuff	Dry Matter	Protein	Carbohydrates	Fat	Total Nutrients
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Shelled Corn	89.4	7.8	66.8	4.3	84.28
Wheat	89.5	8.8	67.5	1.5	.....
Oats	89.6	8.8	49.2	4.3	.....
Wheat Bran	88.1	11.9	42.0	2.5	.....
Middlings	88.8	13.	45.7	4.7	.....
Oil Meal	90.2	30.2	32.0	6.9	.....
Timothy Hay	86.8	2.8	42.4	1.3	.....
Red Clover Hay	84.7	7.1	37.8	1.8	.....
Alfalfa Hay	91.9	10.5	40.5	.9	.....
Wheat Straw	90.4	.8	35.2	.4	.....
Corn Silage	26.4	1.4	14.2	.7	.....
Mangels	9.4	.8	6.4	.1	.....

Questions

1. Which feeding stuff contains the most digestible nutrients?
2. Which the least?
3. Why does oats contain less than corn?
4. Why does corn silage contain less than timothy hay?
5. Which feed contains the most protein?
6. Which hay contains the most?
7. Why is wheat straw worth less per ton than timothy hay?

To the Teacher.—These problems may well be assigned for work in arithmetic, and the results be discussed when the class meets for agriculture. Using the results, other problems may be worked out, such as getting the cost of 10 pounds of digestible nutrients in a few of the common feeds. Use local market prices.

Exercise 9

NUTRITIVE RATIO OF COMMON FEEDS

Object.—To calculate the nutritive ratio of a number of common feeds.

Procedure.—1. The following formula is used in finding the nutritive ratio of feeds.

$$\frac{\text{Lbs. Digestible Carbohydrates} + (\text{Lbs. Dig. Fat} \times 2.25)}{\text{Lbs. Digestible Protein}} = \times$$

$$1 : \times = \text{nutritive ratio.}$$

2. The nutritive ratio answers the question, How many parts, by weight, of digestible carbohydrates and fat, the latter reduced to carbohydrate equivalents, are there in a feed, to each part of digestible protein?

3. The table in exercise 7 shows that 100 lbs. of shelled corn contains,

	Digestible		
	Protein	Carbohydrates	Fat
Corn, 100 lbs.	7.8 Lbs.	66.8 Lbs.	4.34 Lbs.

Then $\frac{66.8 + (4.3 \times 2.25)}{7.8} = \frac{76.475}{7.8} = 9.8$

The nutritive ratio of corn is therefore 1 : 9.8.

4. Copy in the first four columns of the table given below, the nutrients in the feeds mentioned in the previous exercise.

5. Find the nutritive ratio of each of the feeds, in

the same way as has been indicated for corn, and record the results in the last column. Carry these calculations to only one decimal place. If the second decimal is 5 or more, add one to the first decimal: if less than 5, drop it.

TABLE SHOWING POUNDS OF DIGESTIBLE NUTRIENTS IN 100 POUNDS OF FEED AND THE NUTRITIVE RATIO OF THE FEED

Feeding Stuff	Dry Matter	Protein	Carbohydrates	Fat	Nutritive Ratio
	Lbs.	Lbs.	Lbs.	Lbs.	
Shelled Corn.....	89.4	7.8	66.8	4.3	1:9.8
Wheat.....					
Oats.....					
Wheat Bran.....					
Oil Meal.....					
Timothy Hay.....					
Red Clover Hay.....					
Alfalfa Hay.....					
Wheat Straw.....					
Corn Silage.....					

Questions

1. Which feed in the list given above has the greatest percentage of protein?
2. How can you tell?
3. Which has the least?
4. Which hay has the greatest percentage of protein?
5. What use is made of the nutritive ratios of feeds?

To the Teacher.—This exercise furnishes good practical work in arithmetic. Assign the problems for arithmetic work and discuss the results in the agriculture class. All books on elementary agriculture give a good discussion of nutritive ratios. Read Chapter 21, in "An Introduction to Agriculture."

Exercise 10

THE CORN BELT STATES

Object.—To make an outline map of the United States, shading the seven states comprising the corn-belt states, and to show the number of acres devoted in these states to corn, and their yields.

Materials.—Last edition of the U. S. Agricultural Year Book, or the last issue of Statistics of Grain Crops, U. S. Department of Agriculture, Washington, D. C. The latter is sent free on request.

Procedure.—1. Make an outline map of the United States and shade the corn-belt states. Write the name in each state.

2. Fill out the following table, getting the data from the suggested references.

State	Acres Devoted to Corn	Total Yield in Bushels	Yield in Bushels per Acre
Illinois.....			
Iowa.....			
Indiana.....			
Kansas.....			
Nebraska.....			
Missouri.....			
Ohio.....			

QUESTIONS

1. What percentage of the corn grown in the United States is grown by these seven states?

2. Why do these states raise more corn than other states?

Exercise 11

CULLING THE FLOCK

Object.—To learn how to cull, or sort out, from a flock of hens those which are poor layers.

Materials.—At least 6 hens, better 10 or 20.

Explanation.—Every flock of hens should be culled at least once a year in order that the poor layers may be weeded out. If a flock is culled only once a year, September is the best month in which to do the culling. The good laying hen has a short strong beak, her eye is large, bright and prominent. Her whole head is short and strong, but distinctly feminine in appearance. Her body is long and deep for the breed, with parallel top and bottom lines. This gives her room for a large soft abdomen with plenty of food capacity. She is a busy

hungry, happy, noisy bird. She is easily tamed and likes to be petted. Hens that have the characteristics of being good layers and are in good laying condition in September, are the hens which will prove the good layers throughout the year. These should be kept, and all others sold or eaten.

The points which should be given special attention in separating the laying hens from the nonlayers are:

A GOOD TYPE OF LAYING HEN

A TYPICAL NON-PRODUCER

1. Age of hens.—Hens belonging to the dual purpose and meat breeds are rarely profitable as layers beyond their second laying year, and hens of the egg type breeds, beyond their third laying year.

2. Condition of birds.—Sickly looking, inactive hens, with long slim heads and beaks, hens with dark or bluish combs, hens with broken down abdomens, or hens with small appetites, are poor layers. Get rid of them.

3. Color.—In all yellow skinned breeds, those hens

with strong yellow shanks, yellow beaks and yellow vents are not in laying condition. In all heavily laying hens the yellow color has faded out.

4. Molting.—The better laying hens lay late in the fall, so molt late. Cull out those which begin to molt during July or early August.

5. The comb.—Hens not laying often have small, shrunken, hard combs, sometimes covered with white scales.

6. The appearance of the vent.—The vent of a hen not in laying condition is small, contracted, dry, and yellow in color.

7. Condition of the abdomen.—A solid, fat, contracted abdomen is characteristic of non-layers. Also the small stringy abdomen denotes the poor layer. The good layer has a large, soft abdomen.

8. The pelvic bones.—Thick, firm pelvic bones, firmly joined together at the ends, separated by a distance of less than the width of two fingers, and curved in badly shows that the hen is not in a laying condition and is a poor layer.

9. Distance between pelvic bones and the end of the keel.—When this distance is less than the width of three fingers in the smaller breeds and less than four in the larger breeds, the hens are not heavy producers.

Hens having several of the characteristics just given may safely be classified as poor egg producers, and should be sold or eaten.

Procedure.—1. Go with your teacher to study a flock of hens. Watch closely while each point mentioned above is demonstrated to you.

2. Take notes on each bird. Then, when the demonstration is completed, tell from your notes which birds should be culled and which should be kept for the laying flock.

3. Practice culling with your home flock.

To the Teacher.—Make arrangements for this exercise with the father of one of your pupils who will keep at least six suitable hens penned for this demonstration. Either conduct the demonstration yourself, or get the farmer to conduct it.

Reference.—Culling the Flock, Bureau of Animal Industry Cir. Division of Publications, Washington, D. C.

Wisconsin Bull. 261, College of Agr., Madison, Wis.

An Introduction to Agriculture, Chapter 22.

Exercise 12

CORN SURVEY

Object.—To make a corn survey of the school district.

Procedure.—1. The following is a suggested outline for a corn survey or corn census of the school district.

CORN SURVEY

School District No.....Town of.....Co.....

Date.....

	Name of Farmer	Total Acres in Farm	Total Acres in Corn	Acres of Corn for Grain	Total Yield	Yield per Acre	Acres of Corn for Silage	Yield in Tons per Acre
1								
2								
3								
4								
Etc.								

2. One member of the class should copy on the board the outline for the survey, putting down as many numbers as there are farmers who raise field corn in the school district. One representative of each farm family in the school should copy the outline and take it home to be filled out as accurately as possible. Members of the agriculture class who have this book need not copy the outline, but should enter the data in the book.

3. When a farm family in the district is not represented by children in the school, some member of the school should try to get the data from that farm. An effort should be made to get the data from every farm where field corn is raised in the district to make the survey complete.

4. Each pupil should write on the board the name of the farmer assigned to him and the data he obtained. The upper classes should then determine the totals. The average yield of the district is obtained by dividing the number representing the total yield in bushels or tons, by the total number of acres devoted to the crop.

5. Each member of the agricultural class should have a copy of the complete survey, to put into a survey booklet of the school district suggested for June.

Project 1

GATHERING AND STORING SEED CORN

Object.—A good seed corn project is one in which the good corn, fit for seed, and raised by the pupil in a corn growing project, is carefully gathered, selected, cured, and stored for future use or sale.

Preparation.—1. Read Exercise 5 on Selecting Seed Corn. Learn the characteristics of the corn you have planted so that you will be able to select seed true to the breed or variety.

2. Roughly determine how many ears or bushels of seed corn you can cure and store properly.

3. Study methods of curing and storing seed corn.

THESE YOUNG PROJECT WORKERS WILL GET GOOD RESULTS.—*Courtesy Iowa State Teachers' College*

4. Determine how you are going to store the corn and what materials you will need for the purpose.

5. Make all necessary preparations to conduct the project properly.

Procedure.—1. Keep accurate records of all the time you devote to this project. Provide yourself with a vest pocket note book.

2. Gather the corn; cure, and store it properly.

3. Keep accurate records of all expenses incurred in the project.

4. In the spring, test each ear of corn (see outline for March), and sort it into two grades.

5. When you have disposed of the corn, fill out a summary sheet as suggested below, and determine the profit you have made in the project.

Seed Corn Project—Summary Sheet

Number of bushels of corn gathered in the fall .....
Number of bushels of corn cured and stored .....
Number of hours of labor in gathering the corn .....
Number of hours of labor in curing and storing corn..
Number of hours of labor in testing and grading .....
Other time—hours.....

EXPENSES

Value of				
.....bushels of corn cured and stored	@	$.....per bu.		$.....
.....hours of labor in gathering the corn	@	.....¢ per hr.		.....
..... " " " " curing and storing	@	..... " " "		.....
..... " " " " testing and grading	@	..... " " "		.....
..... " " other labor	@	..... " " "		.....
Other expenses incurred in the project (itemize these)				
Total expenses				$.....

RECEIPTS

.....bushels of seed corn sold (Itemize your sales)	@	$.....per Bu.	$.....
.....pecks of corn kept for own use	@	..... " "	.....
.....bushels of corn not sold for seed (Usually all corn cannot be sold for seed)	@	..... " "	.....
Total Receipts			$.....
Less Total Expenses			.....
Profit			$.....

6. Write a brief discussion of the project.

References.—F. B. 229: Production of Good Seed Corn. F. B. 415: Seed Corn.

To the Teacher.—It may be desirable, in some cases, to bring the project to a close after the seed corn is cured. In that case, the items on testing, and perhaps some of those on grading, will have to be omitted from the summary. For a discussion of project work see Chapter 28 in "An Introduction to Agriculture," published by D. Appleton & Co., and also Bul. 385, School Credit for Home Practice in Agriculture, U. S. Dept. of Agriculture; F. B. 537, How to Grow an Acre of Corn; F. B. 729, Corn Growing in the South.

One project, well done and carefully written up, is of far more benefit to a child than a half dozen projects imperfectly accomplished. No child should be engaged in more than one project at one time, as long as the project upon which he is working is at a stage to require his regular attention. The number of projects given for each month is to allow a child a choice, and also to permit some variety of interest in such work throughout the school.

Project 2

HARVESTING AND STORING WINTER APPLES

Object.—To harvest and store winter apples or other fruit, which may otherwise be wasted, to be later used or sold.

Explanation.—On many farms there are usually many good apples going to waste which later in the season may be sold to good advantage, if the sound apples have been carefully gathered and stored.

Preparation.—1. Determine if there is likely to be a market for apples later in the season.

2. Find out if it will pay you to gather and store surplus apples.

3. Study how to harvest and store fruit properly.

Operation.—1. Carefully gather and store the fruit for which you intend to be entirely responsible. Measure it as you store it, and record the amounts in a tabular form as suggested:

Fruit Stored	Quantity	Approximate Value

2. Keep an account of your time and of other expenses in connection with the project.

3. Record at each instance of use or sale, the amount and value of the fruit used or sold. Do this in a tabular form as suggested:

Fruit Sold	Quantity	Price	
		Cash	Home Use

4. When the project is completed, fill out a summary sheet as suggested, and write a brief story or discussion of the project and put in it all records.

Total value of fruit sold.....	$.....	
Total value of fruit used at home.....	.....	
Total receipts.....		$.....
Expenses.....	$.....	
Labor.....	.....	
Total expenses.....		$.....
Profit.....		$.....

Reference.—F. B. 879: Home Storage of Vegetables. Any book on Vegetable Gardening. Department Bulletin 579: Celery Storage of Vegetables, 5 cents.

To the Teacher.—Write to the States Relation Service, U. S. Dept. of Agriculture for S. R. S. Leaflet: "How Teachers in Rural Schools May Use Publications on Home Storage of Fruits and Vegetables." It will help you to direct this and the next project.

Project 3

STORING WINTER VEGETABLES

Object.—To store properly, for winter use, some of the common garden vegetables.

Preparation.—Study methods of storing properly such vegetables as beets, carrots, cabbage, celery, etc.

Procedure.—1. Put into proper order the place in which you plan to store the different vegetables.

2. When soil and weather conditions are favorable, dig and store the vegetables. Measure the quantity of each vegetable as it is being stored.

3. Keep account of all the time you devote to the project.

4. From time to time examine some of the vegetables to see how they are keeping.

5. Make out a summary sheet showing the quantity of each kind of vegetable stored, the value of each kind, the total value of all the vegetables, and the time devoted to the project.

6. Write a brief story about the project and in it put all records in a tabular form as outlined in previous project.

Reference.—F. B. 879: Home Storage of Vegetables. F. B. 847: Potato Storage. Any Vegetable Gardening Book.

EXHIBITS

1. *Corn Show.*

Have each member of the class bring to school the best ten ear sample of corn from the home farm. Arrange this corn in an orderly and attractive way. Invite

some one to judge the samples and to give a talk on corn.

2. *Vegetable and Fruit Exhibit.*

Have all pupils who wish bring to school small samples of all the different vegetables raised on the home farms. Number and display the samples, and some evening invite the patrons to see them, and have some one judge the vegetables.

Reference.—S. R. S. Doc. 42: Agricultural Exhibits and Contests. U. S. Dept. of Agriculture. Free. F. B. 617: School Lessons on Corn. F. B. 870: The Community Fair. S. R. S. Doc. 55: Ext. N. Boys' and Girls' Exhibits. S. R. S. Doc. A. I. 2: Agricultural Exhibits and Contests.

THINGS TO OBSERVE IN SEPTEMBER

Some good fields of corn
The storing of vegetables
The filling of a silo
Injurious insects
Winter cover crops
Drying fruits and vegetables
Blight, rust, smut, mildews
The selecting of seed potatoes
Good fall gardens
A corn binder at work

To the Teacher.—Read Table 1 in the appendix of "An Introduction to Agriculture," published by D. Appleton & Co. It tells how to secure government publications.

Send to your State Agricultural Experiment Station for a list of available bulletins and order in advance the bulletins and circulars that pertain to any of the exercises or projects in the book. See page 216 for the address of your Experiment Station.

OCTOBER

Exercise 1

A STUDY OF SOILS

Object.—To make a simple study of the common soils of the community and to collect samples of them.

Explanation.—The four common classes of soils are the sandy, loam, clay, and marsh soils. These have characteristic properties. The U. S. Dept. of Agriculture, in connection with the State Agricultural Colleges, is making county soil surveys. These surveys describe the different soils of a county and on a map show the location of the soils. If your county has been surveyed, the survey map will make this study of soils very interesting.

A RURAL TEACHER ACQUAINTING HER PUPILS WITH THE DIFFERENT SOILS IN THE COMMUNITY.—*Courtesy Iowa State Teachers' College*

Materials.—A spade, a half dozen quart Mason jars, a Soil Survey map, if available.

Procedure.—1. Go with your teacher to visit places near the school where the different soils can be found.

2. Describe each different kind of soil you examine,

stating its principal characteristics. Classify each soil.

3. The class should collect a quart jar full of each of the different soils examined. These samples should be preserved at school for future use.

4. Try to visit a place where a cut or excavation has been made. Note the color of the top soil; of the subsoil. How deep is the top soil?

To the Teacher.—If you undertake this exercise locate the different soils beforehand and take the class to examine them. Write to your State Agricultural College and inquire for a soil survey of your county, if it has been surveyed. Table 4, Appendix gives address. Additional information on the use of soil surveys write to the U. S. Dept. of Agriculture for S. R. S. leaflet, "How Rural Teachers May Use a Soil Survey." This publication is free.

Exercise 2

SCALE INSECTS

Object.—To study and to be able to recognize some of the common scale insects on trees.

Materials.—Several hand lenses or magnifiers; pruning shears or a sharp knife; one or two Mason jars.

Explanation.—The oyster-shell scale, and the San José scale are two common scale insects frequently found on many kinds of fruit and shade trees. A careful study of the dying branches of different trees usually reveals the presence of some of these pests. These scales are pictured and described in all agricultural text books.

Procedure.—1. Examine the dying branches on some fruit and shade trees. Can you see any scale insects?

Use the hand lens. Examine some of the living branches. Are there any scale insects on them?

2. Collect and describe samples of the oyster-shell scale. Cut off small pieces of the branch with the pruning shears and put them in the Mason jar. Make a drawing of a branch showing the scale as seen through the magnifier.

3. Repeat the directions given in 2 for the San José scale.

4. Tell how to get rid of each of these pests.

5. Examine the skins of grape fruit and of oranges for the presence of scale insects.

Questions

1. How do scale insects do harm?
2. Should they be controlled? Why?
3. What are good sprays for these pests?

To the Teacher.—Locate these pests on trees before taking the class to inspect them. Give the class an idea what to look for. Some one in the community may be able to help you locate infected trees. If you do not take the class out, gather a few branches infected by each scale, to be studied in class. These insects are fully described and well pictured in "An Introduction to Agriculture," published by D. Appleton & Co., and in other agricultural text books.

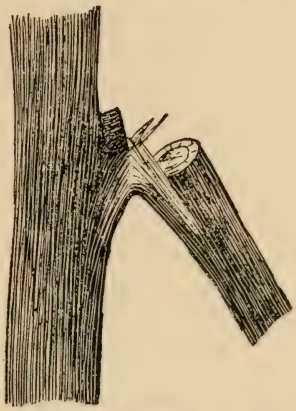
Exercise 3

PRUNING TREES

Object.—To study the proper way to prune a tree.

Materials.—Pruning shears; small cross cut saws; ladders.

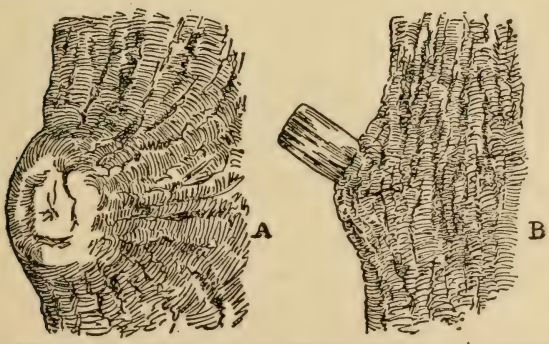
Explanation.—The class should be taken to a fruit or shade tree which is in need of pruning. Here a demonstration on pruning should be given, preferably by the owner of the tree or by the County Agricultural Agent who will gladly do this if requested. Some of the boys may do the work but they should be directed.



METHOD OF CUTTING A LARGE LIMB WHICH SHOULD BE AVOIDED.—*Courtesy U. S. Department of Agriculture*

Procedure. — 1. Observe how some broken, injured, or diseased branches are removed. Note that the cuts are made as near the main branch of the tree as possible, and parallel to it. Why?

2. Assist in removing any limbs which injure, by



RESULTS OF CORRECT AND INCORRECT PRUNING. A, correct method; after two years; B, incorrect method.—*Courtesy U. S. Department of Agriculture*

rubbing other portions of the tree. Why should these be removed?

3. Remove some water sprouts. Why should these be removed?

4. Undesirable branches in the center of the tree, which make the foliage too dense, should be removed. Why?

5. If you are going to remove a large branch, where should the cuts be made. Why?

6. Make drawings of all the different kinds of limbs removed, showing where cuts have been made.

Questions

1. Why not chop branches off?
2. Why are the central parts of the trunks of so many trees decayed?
3. Should horses be tied to trees?
4. When should needed pruning be done? Why?
5. During what season of the year should no pruning be done?

To the Teacher.—It may be possible that the trees on the school grounds would be benefited by a little pruning. Ask some farmer to bring a few ladders. The boys will bring the saws and shears if asked. Write to the County Agricultural Agent located at the county seat and ask him if he does not want to assist. Ask farmers to attend the demonstration.

Exercise 4

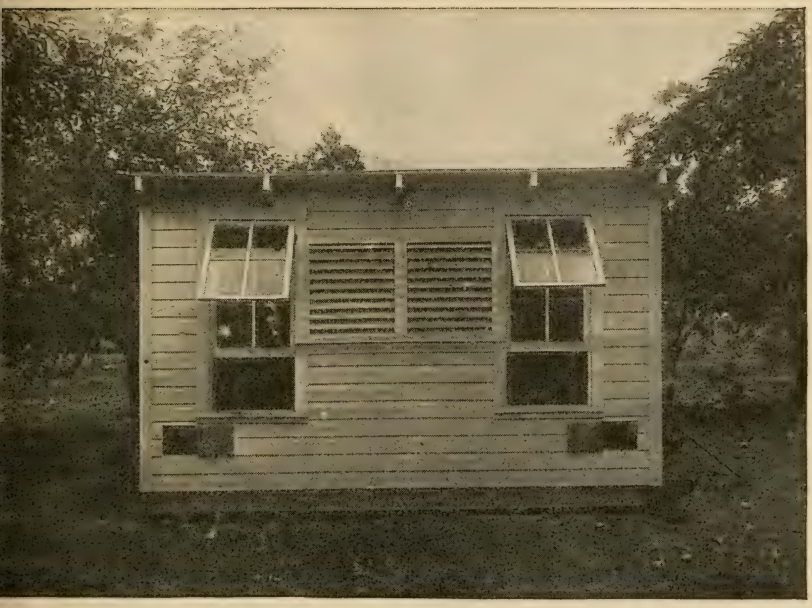
POULTRY HOUSES

Object.—To make a study of a few poultry houses.

Materials.—Yard sticks, paper, and pencils.

Procedure.—1. With your teacher make a study of one or two good poultry houses in the community.

2. Measure the dimensions of the floor area of each house inspected, the height of the house in front, and in the rear.



FRONT VIEW OF AN IDEAL POULTRY HOUSE.—*Courtesy Missouri Poultry Experiment Station*

3. Inquire how many birds are kept in each house and determine the floor space per bird. How many square feet of floor space should there be for each bird?

4. Study the interior of each house. Measure the height above the floor of the dropping platform, and the

feeding platform. How many inches of roosting space are there in each house for each bird?

5. Measure the size of the nests. How many nests are there in each house? How many nests per bird? How many should there be?

6. Note the floor in each house and the litter on it. Have the hens a good place in which to scratch?

7. How is good ventilation secured in the houses? Make three drawings, showing the front view, the sectional view, and the floor plan of one of the good poultry houses studied. These plans should be drawn to a scale and should be made accurately. A good scale is one which allows, on the plan, ¼ inch to each foot. The drawings should not be made at the time of the trip while notes are being taken, but should be carefully drawn at school or at home.

Questions

1. Why should there be a dropping board under the roosts in a poultry house?
2. Why should the feeding platforms be raised?
3. Why is good ventilation essential in a poultry house?

References.—Consult any poultry book. "An Introduction to Agriculture," Chapter 22. F. B. 574: Poultry House Construction. Dept. Bul. 464: Lessons on Poultry for Rural Schools. 10 cents.

To the Teacher.—Find out where there are a few good poultry houses near the school. Ask the owners to allow you to take the class to make a study of these.

Exercise 5

THE NUTRITIVE RATIO OF A RATION

Object.—To learn to calculate the nutritive ratio of a ration.

Materials.—A table showing the amount of digestible nutrients in feeding stuffs. (See Table 1 in Appendix.)

Procedure.—1. A ration is all the food an animal eats in one day, or twenty-four hours, whether it is fed once a day, twice a day, three times, or oftener. If an animal is fed and eats 5 lbs. of timothy hay, 2 lbs. of corn, and 1 lb. of oats three times a day, its ration will consist of 15 lbs. of timothy hay, 6 lbs. of corn, and 3 lbs. of oats.

2. The formula for finding the nutritive ratio of a ration may be stated as follows:

$$\frac{\text{Total amt. dig. carbohydrates} + (\text{total amt. dig. fat} \times 2.25 = \text{x.})}{\text{Total amount of digestible protein}}$$

Therefore the nutritive ratio will be 1 : x.

3. The nutritive ratio of the ration, mentioned above is here calculated to show how to use the formula.

Ration		Digestible		
Feed	Pounds	Protein Lbs.	Carbo-hydrates Lbs.	Fat Lbs.
Timothy hay.....	15	.42	6.36	.20
Corn.....	6	.47	4.01	.26
Oats.....	3	.26	1.48	.13
Totals.....		1.15	11.85	.59

$$\frac{11.85 + (.59 \times 2.25)}{1.15} = \frac{13.18}{1.15} = 11.5$$

Therefore the nutritive ratio of the ration is 1 : 11.5.

In all these calculations it will greatly simplify and

unify the work if they are carried to one decimal point. If the second decimal is five or more, add one to the first decimal; if less than five, drop it.

4. Calculate the nutritive ratio of the following ration, and put the work in tabular form as in 3.

Alfalfa hay, 15 lbs.; Corn, 6 lbs.; Oats, 3 lbs.

5. Calculate the nutritive ratio of the following ration:

Clover hay, 15 lbs.; Corn, 6 lbs.; Wheat bran, 3 lbs.

6. Find out some rations which are being fed to some animals, and calculate the nutritive ratio of one or more of these rations. Put the work in tabular form as in 3.

Questions

1. Why do these nutritive ratios vary?
2. Of what importance are nutritive ratios?
3. What is gained by using a leguminous hay in place of timothy hay?

To the Teacher.—These problems may be assigned for work in arithmetic, and the results be discussed when the class meets for agriculture. Many arithmetic books give problems on ratios. In this exercise are given some practical problems.

Exercise 6

THE COST OF A RATION

Object.—To find the cost of a ration being fed to some farm animals.

Procedure.—1. If a horse is being fed 10 lbs. of timothy hay and 10 lbs. of oats in one day, what will be the cost of the ration if the hay is worth $20.00 per ton, and the oats $.64 per bushel? One bushel of oats weighs 32 lbs.

Cost of hay	$= \frac{10}{2000}$ of $20.00	= $.10
Cost of oats	$= \frac{11}{32}$ of .64	.20
Cost of ration		$.30

2. In calculations such as the one given above, what prices to attach to the different feeds is a debatable question. All newspapers quote the wholesale prices of the feeds and it will simplify the work to use the prices quoted in the daily papers in figuring the cost of a ration. Where prices are not quoted in the papers, use those for which some neighboring farmer is willing to sell the feed.

3. Find out a ration being fed to dairy cows; to a horse; etc.; and figure the cost of these rations.

4. From the results in paragraph 3, find the cost of the feed of each animal for a month, and for a year, assuming that the rations and the cost of the feeds remain the same.

5. Ask some one what it costs to feed a horse or a cow for a year, and compare your results in 4 with these figures.

To the Teacher.—Assign the problems for work in arithmetic. These are good practical problems. Make up other similar problems.

Exercise 7

WINTER RATIONS FOR POULTRY

Object.—To make a study of rations for winter egg production.

Explanation.—The production of eggs in winter from pullets, and to some extent from hens, may be greatly stimulated by good methods of feeding. In most communities there are some farmers who get many eggs from their flocks during the winter. By studying their methods of feeding much may be learned. Also by studying the records of egg laying contests one may get good ideas as to what feeds produce the best results. In a recent egg laying contest the average pen of 10 pullets produced,—

53 eggs in November	94 eggs in January
75 eggs in December	122 eggs in February

(Fifth International Egg Laying Contest, Storrs, Conn.)

Procedure.—1. Find out what some farmer, who gets many eggs from his flock in the winter, is feeding and observe his methods of poultry management.

2. In a tabular form, write down the ration being fed. If time permits calculate the nutritive ratio as suggested in exercise 5.

3. In like manner tabulate the ration being fed to the poultry at your home. How do the two compare?

4. In a recent experiment at the Indiana Experiment Station three pens of Leghorn pullets were fed the following rations, and the average hen in each pen laid the number of eggs indicated below:

PEN 1		PEN 2	
Scratch Feed	Dry Mash	Scratch Feed	Dry Mash
10 lbs. corn 10 lbs. oats 5 lbs. wheat	5 lbs. bran 5 lbs. shorts 3½ lbs. beef scraps	10 lbs. corn 10 lbs. oats 5 lbs. wheat	5 lbs. bran 5 lbs. shorts 50 lbs. skim milk
Eggs per pullet in one year, 135		Eggs per pullet in one year, 133.5	

PEN 3.

Scratch Feed	Dry Mash
10 lbs. corn 10 lbs. oats 5 lbs. wheat	5 lbs. bran 5 lbs. shorts no beef scraps nor milk
Eggs per pullet in one year, 36	

Questions

1. Why was the number of eggs produced by the average pullet in pen 3 so much lower than that of the other two?
2. Why should some form of animal feed, like skim milk or beef scraps, be used, especially in the winter?
3. Why are dry mashes fed to poultry?

References.—A poultry book. An Introduction to Agriculture, Chapter 22. F. B. 889: Back-Yard Poultry Keeping. F. B. 287: Poultry Management.

Exercise 8

POULTRY RECORDS AND ACCOUNTS

Object.—To learn to keep accurate, systematic, and business-like accounts of a small poultry flock.

Explanation.—1. To learn to be able to keep accurate and systematic records of any enterprise is an excellent training for all boys and girls. Accuracy, neatness, and

regularity of entries spell success in this work. Never put off recording any data until to-morrow.

2. The essential parts of a complete poultry record are the opening inventory, the egg record, the income, the expenses, the closing inventory, and the summary sheet.

The opening and closing inventories include the value of the house, fencing, equipment, and poultry.

The egg record shows the number of eggs laid each day in every month.

The income includes the value of the eggs used at home, the cash sales of eggs, the sales of poultry, the value of poultry used at home, and the value of the eggs used or sold for hatching.

The expenses include the value of the home feed used, of the feed purchased, of the equipment purchased, of the labor expended, and of the interest on the investment.

Procedure.—The following is a year's record of 12 White Leghorn pullets from Nov. 1, 1916 to Nov. 1, 1917. From the information given, fill out and complete the monthly summaries, and the final yearly summary given at the end of this exercise.

Opening Inventory—Nov. 1, 1916:	
Value of poultry house and fences.....	$12.00
Value of feed hoppers and feed troughs.....	2.00
Value of 12 pullets.....	12.00
Total.....	

Enter these on the final summary sheet.

3. *The Egg Record.*—Daily egg records should always be kept and from these the monthly egg yield may be

determined. Below is given the monthly egg yields of the 12 pullets for the year. Enter these statistics on the sheet of monthly summaries.

Nov.	24	Feb.	229	May	274	Aug.	191
Dec.	143	Mar.	267	June	237	Sept.	180
Jan.	262	Apr.	299	July	246	Oct.	103

4. *The Income.*—There should be an income sheet for each month, showing the itemized sales, and the number of eggs and fowls used in the home with a value attached to each item. In the flock of 12 pullets whose record is used in this exercise, the income consisted of eggs sold and eggs used in the home. Copy these records and the totals on the sheet for monthly summaries. (Article 7.)

	Nov.	Dec.	Jan.	Feb.	Mar.	Apri
Cash sales of eggs.....	....	$2.23	$6.28	$4.56	$3.20	$4.17
Value of eggs used.....	$.70	2.19	2.77	2.74	2.67	3.28
Total income.....						

	May	June	July	Aug.	Sept.	Oct.
Cash sales of eggs.....	$5.22	$4.45	$4.28	$3.99	$2.96	$2.47
Value of eggs used.....	1.40	1.67	1.95	1.30	2.59	.79
Total income.....						

5. *The Expenses.*—Below are itemized the expenses for November, 1916.

Date	Item	From Whom	Amount
Nov. 1	½ bu. wheat	Dadmun Bros.	$.65
Nov. 1	½ bu. oats	" "	.25
Nov. 1	¼ bu. corn	" "	.20
Nov. 2	15 lbs. egg mash	Warner's	.45
		Total	$1.55

The expenses for the remaining eleven months, all for feed, were:—

Dec.	$2.05	Mar.	$1.78	June	$2.77	Sept.	$1.95
Jan.	2.15	Apr.	2.53	July	1.90	Oct.	1.75
Feb.	2.03	May	1.75	Aug.	1.65		

Enter these on the sheet for monthly summaries. There were no other cash expenses.

6. *Closing Inventory.*—Nov. 1, 1917.

Value of house and fences	$12.00
" " feed hoppers and feed troughs	2.00
" " 12 hens @ $1.50	18.00
Total	

Enter the total on the final summary sheet.

7. *The Monthly Statement Sheet.*—Fill this out from the data already given.

MONTHLY SUMMARIES

Month	Eggs Laid	Eggs per Bird	Cash Sale of Eggs	Value of Eggs Used	Total Value of Eggs	Cost of Feed	Profit over Feed Cost
Nov.							
Dec.							
Jan.							
Feb.							
Mar.							
Apr.							
May							
June							
July							
Aug.							
Sept.							
Oct.							
Total							
Av. per bird							

8. *Final or Yearly Summary.*—

		Dr.	Cr.
1.	Opening Inventory	xx	
2.	Total Receipts (all sales and products used at home)		xx
3.	Total Expenses (not including labor)	xx	
4.	Closing Inventory (value of everything at close of year)		xx
5.	Interest on Investment	xx	
6.	Totals	xx	xx
	Profit or Labor Income	xx	

9. Labor records, if kept, should be recorded similarly to the daily egg records. The value of all the labor

subtracted from the profit over feed, will give the net profit.

10. What was the average number of eggs laid per bird during the year? What was the cost of feed per bird for one year? What was the total profit over the cost of feed for the entire flock? (Determine this last item from the final summary sheet.)

To the Teacher.—This is an excellent problem in arithmetic and elementary bookkeeping. Assign it for arithmetic work. This is an actual record taken from the book of a young project worker.

Exercise 9

POULTRY BOOKLET

Object.—To make an illustrated booklet showing the common breeds of farm poultry and to describe each breed.

Procedure.—1. Take a number of uniform sheets of writing or laboratory note book paper, and plan to make use of them as if they were blank pages in a book.

2. Devote the first sheet to the table of contents, recording the exercises contained in the booklet in a columnar form as suggested:—

TABLE OF CONTENTS

1. Common Classes of Poultry.
2. Asiatic Class.
3. Mediterranean Class
4. American Class
5. Our Flock.

2. Write only on one side of the paper. On sheet 2 briefly discuss the classification of poultry, naming three

or four of the common classes, and illustrate each class with a small picture cut from an old poultry journal. When putting paste on the cut, add a very small amount

SAMPLES OF GOOD POULTRY BOOKLETS.—*Courtesy Rural students, State Normal, Whitewater, Wis.*

only to the four corners; this will prevent the wrinkling of the paper. Try to use one sheet only for each topic mentioned in the table of contents, and put the name of the topic on the first line of each sheet.

3. Devote sheet 3 to the characteristics of the Asiatic

class and in a tabular form show the names of the breeds of this class and the varieties of each breed. Insert one picture for each breed if possible.

4. Devote sheet 4 to the Mediterranean class in the same way as was suggested in 3 for the Asiatic class.

5. Devote sheet 5 to the American class.

6. Devote sheet 6 to the variety of poultry which you have at home. Classify the birds of your own flock and tell why your parents prefer that particular breed and variety.

7. Cut two sheets of colored construction paper so that they will be about one-eighth of an inch larger on all four sides than the writing paper. Use these as covers for the booklet. Bind the book with colored cords. Give the booklet a name such as

Breeds of Poultry,
Poultry Booklet,
Classification of Poultry, etc.

Print the name neatly, or cut letters from construction paper and paste these on the cover. Finally, paste an attractive poultry picture on the outside.

8. Let the booklet be an example of your best work in writing, language, drawing, and design. You are judged, by people who do not know you, by the kind of work you do.

Exercise 10

POTATO SURVEY

Object.—To make a potato survey of the school district.

Procedure.—1. The following is a suggested outline for a potato survey of the school district.

POTATO SURVEY

School District No. ..... Town of ..... County.....

Date.....

Name of Farmer	Total Acres in Potatoes	Acres in Early Potatoes	Variety	Acres in Late Potatoes	Variety	Total Estimate	Yield per Acre
1							
2							
3							
4							
Etc.							

2. One member of the class should copy on the blackboard the outline for the survey. One representative of each farm family should copy the outline on a sheet of paper and take it home to be filled out with answers as nearly correct as possible.

3. When a farm family in the district is not represented by children in the school some member of the school should try to secure the data. An effort should be made to get the data from all the farms in the school district.

4. The data gathered should be written on the board. Get the totals. In getting the average yield for the district, divide the number representing the total yield in bushels by the number representing the total number of acres planted to potatoes.

5. Each member of the class should copy all the data to be saved for a survey booklet to be completed at the end of the school year.

Project 1

KEEPING POULTRY RECORDS

Object.—To keep accurate records of the home poultry flock for a period of six months or a year.

Explanation.—This is an excellent project for a boy or girl in either seventh or eighth grade. The project need not involve any care of the flock; such a project is outlined in November. Merely keeping the records of the flock is an excellent project in itself, involving arithmetic and all the fundamentals of bookkeeping. There is some recording to do every day, and this keeps up the interest. The work also offers excellent opportunities for comparing the home flock with other flocks, thus allowing the owner to get an idea of how well his flock is doing.

Procedure.—1. Carefully read over exercise 8 outlined in this chapter. If you have worked this exercise, completing the monthly and yearly summary sheets, you should have a good, definite idea of how to complete poultry records. If you have not, it will be to your advantage to work the exercise.

2. Supply yourself with a ten cent composition book, about 7 x 8 inches or a little larger.

3. Use the first page for the title and the purpose of the project. Make all the work so neat that you will never be ashamed to show the book to any one.

4. Use page 2 for the opening inventory. Write this out on scratch paper first, check up all data and figures to see that they are correct, and then enter these in the book. Use page 3 for the closing inventory.

5. Use pages 4 and 5 for the daily records as suggested in exercise 8 of this month.

6. Use page 6 for one month's receipts, and page 7 for expenses of the same month. If you are going to keep a six months' record, you will need 12 pages for receipts and expenses; if a year's record, 24 pages.

7. Use two pages for the monthly summary sheet, or report. See exercise 8.

8. Use one page for the yearly or semi-yearly summary report.

9. Plan out your work and your book. Show your plans to your teacher and parents to see if everything is provided for. Get some one at home to put the valuations on all the items for the opening and closing inventories.

10. If labor records are to be kept, record the hours of work as you do the daily egg records. Determine the value of the work per hour and use these figures in your final summary sheet.

References.—F. B. 889: Back-Yard Poultry Keeping. F. B. 562: Boys' and Girls' Poultry Clubs. Poultry Calendar, The Quaker Oats Co., Chicago, Ill., Free. Bul. 464, U. S. Dept. of Agriculture: Lessons on Poultry for Rural Schools, 10 cents.

Project 2

PUTTING THE GARDEN INTO A GOOD WINTER CONDITION

Object.—To clean up the garden, to fertilize it, to plow or spade it so as to have it ready for spring garden work.

Explanation.—This is a short time project which may be well done by any boy in seventh or eighth grade. Too many gardens are neglected in the fall and present

an unsightly condition during the winter. To get a garden into a good winter condition is a splendid project.

Preparation.—1. Make a study of the care of the garden in the fall. Find out the value of preparing the garden in the fall.

2. What vegetables may be left in the garden all winter?

3. What is gained by manuring the garden in the fall? By plowing it in the fall?

4. Why should not the plowed garden be harrowed in the fall?

Procedure.—1. Accurately measure the garden and make a sketch of the garden plan, showing in a general way where the different vegetables were grown. This plan may help in forming the plan for the coming year.

2. Remove all crops, not already harvested, which are not to remain in the ground.

3. Remove all material not suitable for plowing under.

4. Fertilize the garden with manure.

5. Plow or spade the garden and leave it in a rough condition during the winter.

6. Keep records of your time, other help, and horse labor. Give all these a value per hour, and figure the cost and value of the manure.

References.—F. B. 818: Home Vegetable Garden. F. B. 936: City and Suburban Garden. F. B. 937: Farm Gardening in the North. F. B. 934: Farm Gardening in the South

Exhibits

POULTRY EXHIBIT AND SALE

1. In some localities, where a number of boys and girls are engaged in poultry raising projects, they hold

an occasional poultry show or exhibit, and have a poultry sale.

2. Three or four school districts, or those of a township, combine to hold the poultry show. The entry list includes cockrels and pullets of each of the common varieties raised. Sometimes this list is extended to old birds. Usually ribbons are given as prizes.

3. In the sale held in connection with the poultry show, all surplus cockrels and pullets are scored and valued by a good judge. It is assumed, of course, that all the birds are pure bred. Farmers are then encouraged to buy the pure bred stock. In one rural school poultry sale, the cockrels sold from $.50 to $10.00.

4. Each boy should make his own exhibition coops.

EXHIBIT OF PROJECT BOOKLETS

1. Each school should make occasional efforts to show the community some of the work being done by the pupils. Project and club work should always be emphasized. Exhibits of project booklets, together with other agricultural booklets, make an interesting display.

2. A program for the benefit of the community, in which the pupils give brief accounts of their project work, and of their booklet making, will invariably prove interesting to the community.

(See Exhibits in September.)

THINGS TO OBSERVE IN OCTOBER

Well housed poultry flocks
Different breeds and varieties of poultry
Fall plowing
Mulching strawberry plants
Breeds of swine
Winter crops
Alfalfa fields in good winter condition

NOVEMBER

Exercise 1

STUDY OF AN EAR OF CORN

Object.—To make a study of a mature ear of corn.

Explanation.—A good ear of dent corn should have a nearly cylindrical shape. Its length varies with the soil and season but should be from 8 to 10 inches. The circumference of a good ear is about three-fourths of its length. Most ears of dent corn have about 16 rows, each row containing about 50 kernels of which about 35 should be fit for seed.

Materials.—Each member of the class should have a fairly good ear of corn of a variety grown in the community, and a ruler. A small household balance or scales.

Procedure.—1. Determine the answer to each of the following ten items by referring to the ear of corn you have.

1. Length .....
2. Circumference .....
3. Number of rows .....
4. Kernels per row .....
5. Total kernels on ear ....
6. Weight of ear .....
7. Ears required for a bushel at 70 lbs. per bu. ....
8. Kernels fit for seed ....
9. Number of ears required to plant one acre when drilled at 3′ 6″ x 14″ .... (10,688 kernels are required)
10. Number of ears required to plant one acre when checked at 3′ 8″ x 3′ 8″ three kernels in a hill .... (9,720 kernels are required)

2. The circumference is usually measured one-third of the distance up from the butt, by encircling the ear with a strip of paper and then measuring this paper with a ruler.

3. Item 8, "Kernels fit for seed." All the irregular tip and butt kernels are discarded for seed. Count the number of regular kernels on an average row and multiply this number by the number of rows.

4. In item 7, a common estimate, generally used, is 120 ears per bushel. Does the corn you studied run above or below this average?

5. It is commonly estimated that it requires from 12 to 15 ears of corn to plant an acre. How does the corn you studied compare with this estimate?

Questions

1. Drilling corn in rows 3′ 6″ apart and the kernels 14″ apart in the row would be equivalent to planting how many kernels in a hill, if the hills are 3′ 6″ x 3′ 6″?
2. What was the average number of rows on all the ears studied?
3. What was the average weight of all the ears?
4. What would be the number of ears required for 70 lbs., using the average weight per ear?
5. How many average ears would be required to plant an acre in hills 3′ 8″ x 3′ 8″, three kernels per hill?

Exercise 2

A. Learning to Know the Different Grains

Object.—To examine heads and threshed samples of wheat, rye, barley, and oats; and to be able to identify each.

Materials.—Heads of wheat, rye, barley, and oats, and threshed samples of each, balance, 1 pint measure (dry).

Procedure.—1. Examine a head of wheat. Compare it with a head of rye, of barley, and of oats, and note how it differs from each of them. Compare threshed wheat with threshed samples of all the other grains and note how it differs from each of them.

2. Repeat 1 with rye. How do the threshed samples of rye differ from those of wheat?

3. Repeat 1 with barley. Separate the kernel from the hull and compare it with the separated kernel of wheat and of rye.

4. Repeat 1 with oats.

5. What is the legal weight per bushel of each of these four grains in your state? What is the weight of a bushel of shelled corn? Why is oats so much lighter than the others? What is the present market price of a bushel of each of these grains?

B. GRADING GRAINS

1. When car loads of any of these grains reach the large markets, they are graded as shown under Market Grades. The prices of the various grades are quoted in daily newspapers.

2. If time permits, practice grading some of these grains. One pint, dry measure, of each sample is sufficient. From the weight of a pint you can determine the weight of a bushel. Spread the pint of grain out on a tin pie plate and examine it. Then make up your mind into what grade it falls.

MARKET GRADES

Oats

No. 1 White Oats—Shall be white, dry, sweet, sound, bright, clean, free from other grain and weigh not less than 32 lbs. to the measured bushel.

No. 2 White Oats—Shall be 95 per cent white, dry, sweet, shall contain not more than 1 per cent of dirt, and 1 per cent of other grain and weigh not less than 29 lbs. to the measured bushel.

Standard White Oats—Shall be 92 per cent white, dry, sweet, shall not contain more than 2 per cent of dirt and 2 per cent of other grain and weigh not less than 28 lbs. to the measured bushel.

No. 3 White Oats—Shall be sweet, 90 per cent white, shall not contain more than 3 per cent of dirt and 5 per cent of other grain and weigh not less than 24 lbs. to the measured bushel.

No. 4 White Oats—Shall be 90 per cent white, may be damp, damaged, musty or very dirty.

Note—Yellow oats shall not be graded higher than No. 3 White Oats.

Rye

No. 1 Rye—Shall be dry, sound, plump, sweet and well cleaned and weigh not less than 57 lbs. to the measured bushel.

No. 2 Rye—Shall be dry, sound and contain not more than 1 per cent of other grain or foreign matter and weigh not less than 55 lbs. to the measured bushel.

No. 3 Rye—Shall include inferior rye not unsound, but from any other cause not good enough for No. 2 and weigh not less than 53 lbs. to the measured bushel.

No. 4 Rye—May be damp, musty or dirty, and weigh not less than 50 lbs. to the measured bushel.

Barley

No. 1 Barley—Shall be sound, plump, bright, clean and free from other grain, and not scoured nor clipped, shall weigh not less than 48 lbs. to the measured bushel.

No. 2 Barley—Shall be sound, of healthy color (bright or straw color), reasonably clean and reasonably free from other grain and seeds, and not scoured nor clipped, shall weigh not less than 46 lbs. to the measured bushel.

No. 3 Barley—Shall include slightly shrunken or otherwise lightly damaged barley, not good enough for No. 2, and not scoured nor clipped, shall weigh not less than 44 lbs. to the measured bushel.

No. 4 Barley—Shall include barley fit for malting purposes, not good enough for No. 3.

No. 1 Feed Barley—Shall test not less than 40 lbs. to the measured bushel, shall be cool and reasonably free from other grain and seeds, and not good enough for No. 4, and may include barley with a strong ground smell, or a slightly musty or bin smell.

Rejected Barley—Shall include all barley testing under 40 lbs. to the measured bushel, or barley which is badly musty or badly damaged, and not good enough to grade "feed" barley.

Winter Wheat

No. 1 Hard Winter Wheat—Shall include all varieties of pure, hard winter wheat, sound, plump, dry, sweet and well cleaned, and weigh not less than 61 lbs. to the measured bushel.

No. 2 Hard Winter Wheat—Shall include all varieties of hard winter wheat of either or both light and dark colors, dry, sound, sweet and clean, and may contain not more than 25 per cent of soft red winter wheat, and weigh not less than 59 lbs. to the measured bushel.

No. 3 Hard Winter Wheat—Shall include all varieties of hard winter wheat of either or both light and dark colors, not clean or plump enough for No. 2, and may contain not more than 25 per cent of soft red winter wheat, and weigh not less than 56 lbs. to the measured bushel.

No. 4 Hard Winter Wheat—Shall include all varieties of hard winter wheat of either or both light and dark colors. It may be damp, musty or dirty, and may contain not more than 25 per cent of soft red winter wheat, and weigh not less than 50 lbs. to the measured bushel.

—*From "Grades of Grain"—Ill. Grain Inspection Dept., Chicago, Illinois.*

QUESTIONS

1. What are advantages of grading grains?
2. Which grade of these grains is most abundantly found on the markets? (See quotations in newspapers.)

Exercise 3

JUDGING A DAIRY COW

Object.—To learn to judge a dairy cow by means of a score card.

Materials.—Score card for dairy cows, and a dairy cow.

Explanation.—1. A score card enumerates all the important considerations or points commonly considered in judging a dairy cow. The score card also gives a numerical value to each point; the sum of these numerical values is 100, the score of an ideally perfect animal. There are many different score cards for dairy cattle. They differ very little; any one will do. The one here given is applicable to all dairy cows.

SCORE CARD FOR DAIRY CATTLE

Breed..... Name..... Register No. .....

General appearance.—A dairy cow should weigh not less then 800 pounds, have large capacity for feed, a dairy temperament, well developed milk organs, fine quality and perfect health, and be capable of a large production of milk and butter fat.

Points	Perfect	Scorer's	Corrected
Indication of capacity for feed, 25 points:			
Face, broad between the eyes and long; muzzle clean-cut; mouth large; lips strong; lower jaws lean and sinewy	5	.....	.....
Body, wedge shape as viewed from front, side, and top; ribs long, far apart and well sprung; breast full and wide; flanks, deep and full	10	.....	.....
Back, straight; chine, broad and open; loin, broad and roomy	5	.....	.....
Hips and thurls, wide apart and high	5	.....	.....
Indication of dairy temperament, 25 points:			
Head, clean-cut and fine in contour; eyes, prominent, full, and bright	3	.....	.....
Neck, thin, long, neatly joined to head and shoulders, and free from throatiness and dewlap	4	.....	.....
Brisket, lean and light	2	.....	.....
Shoulders, lean, sloping, nicely laid up to body; points prominent; withers sharp	4	.....	.....
Back, strong, prominent to tail head and open jointed	3	.....	.....
Hips, prominent, sharp and level with back	3	.....	.....
Thighs, thin and incurving	4	.....	.....
Tail, fine and tapering	1	.....	.....
Legs, straight; shank fine	1	.....	.....
Indication of well-developed milk organs, 25 points:			
Rump, long, wide, and level; pelvis roomy	3	.....	.....
Thighs, wide apart; twist, high and open	3	.....	.....
Udder, large, pliable, extending well forward and high up behind; quarters, full, symmetrical, evenly joined, and well held up to body	15	.....	.....
Teats, plumb, good size, symmetrical, and well placed	4	.....	.....
Indications of strong circulatory system, health, vigor, and milk flow, 25 points:			
Eyes, bright and placid	2	.....	.....
Nostrils, large and open	3	.....	.....
Chest, roomy	5	.....	.....
Skin, pliable; hair, fine and straight; secretions abundant in ear, on body, and at end of tail	7	.....	.....
Veins, prominent on face and udder; mammary veins, large, long, crooked, and branching; milk wells large and numerous	7	.....	.....
Escutcheon, wide and extending high up	1	.....	.....
Total	100	.....	.....

Remarks .....

Name of scorer ..... Date .....

Bul. 281, U. S. Dept. of Agric.

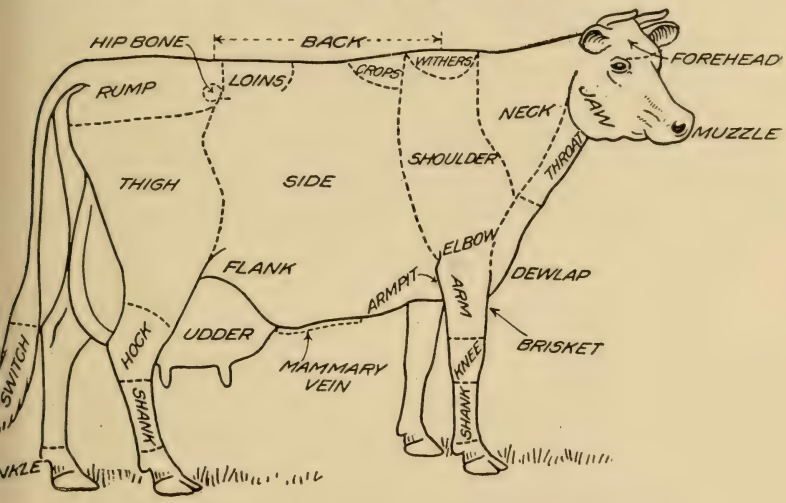
Procedure.—1. First, become thoroughly familiar with the meaning of all the words mentioned on the score card.

2. Then learn to locate accurately the parts of a cow mentioned on the score card.

3. Form an ideal of a perfect cow in your mind.

4. Be able to describe the parts of a cow as they are to be found in a perfect animal.

5. Go, as a class, to a neighboring farm where permission has been obtained to judge one of the cows.



PARTS OF A DAIRY COW.—*Courtesy U. S. Department of Agriculture*

6. With the ideal in mind, proceed to judge the cow. View the animal from all sides and record the score for each point in the proper place on the score card.

7. When you have finished, ask the owner of the cow to score her. Write the owner's score in the third column, called "corrected score." Compare your score with his and note the differences.

8. Does the cow show a good capacity for feed? A

good dairy temperament? Well developed milk organs? Good health and constitution? Is she a good producer? (Ask the owner.)

To the Teacher.—Make arrangements with some farmer near the school to allow your pupils to judge a dairy cow, and leave a score card with him. Drill the class in naming and describing the parts of a cow before you go out to judge the animal. When the pupils have finished their judging, get the owner to judge the animal, and have the pupils write his score in the last column of the score card headed "Corrected."

Exercise 4

COMPETITIVE JUDGING OF DAIRY COWS

Object.—To be able to pick out the first, second, and third best dairy cow from a group of four or five cows, and to state your reasons for your selections.

Explanation.—There occur everywhere contests for boys and girls in judging a group of animals,—that is, picking out the first, second, and third best. This exercise is to help the pupil to learn how this judging is done. To be successful in such contests you need to practice this judging often.

Materials.—A group of four or five dairy cows.

Procedure.—1. The group of cows should be tied to a fence or to separate posts far enough apart to permit each animal to be studied. The animals should be numbered in the group or class.

2. Carefully observe each cow in the group, bearing in mind the four questions asked at the end of exercise 3, and also the most important points mentioned on the score card. Decide which of the cows is the best.

JUDGING ANIMALS DEVELOPS GOOD JUDGMENT.—*Courtesy International Harvester Co.*

Enter her number to right of "First Place," and briefly state under "Remarks," why you consider her to be the best.

STATEMENT FOR COMPETITIVE JUDGING.

Name ..... Date.....

Kind of animals.....

First Place.....

Remarks

Second Place.....

Remarks

Third Place.....

Remarks

3. Follow this same method in selecting the second best cow in the group, and also the third. Under "Remarks" be sure to state the most important reasons, omitting minor details.

To the Teacher.—Make the arrangements for this exercise with a nearby dairy farmer, before undertaking to carry it out. This exercise may be carried out the same day you go to judge a cow, and on the same farm. Clearly explain the exercise to the class before you start out to do the work. Chapter 23, pages 260-261, in "An Introduction to Agriculture," gives good suggestions for this exercise.

Exercise 5

COST OF A POUND OF DIGESTIBLE NUTRIENTS IN DIFFERENT FEEDS

Object.—To calculate the cost of one pound of digestible nutrients, and the cost of one pound of digestible protein in a few common feeds.

Explanation.—Review exercise 8 in September. The formula for calculating the total amount of digestible nutrients in a feeding stuff is:—

Dig. protein + dig. carbohydrates + (dig. fat × 2.25) = total amount of digestible nutrients.

The value of any feeding stuff depends upon the total amount of digestible nutrients it contains, and upon the amount of protein.

Procedure.—1. Below are four feeding stuffs, or feeds. Find the total amount of digestible nutrients, and the amount of digestible protein in 100 lbs. in each of them. Exercise 8, September, shows these. The last column is filled out to serve merely as an illustration.

	Shelled Corn	Wheat	Oats	Wheat Bran	Rye
Total dig. nutrients in 100 lbs.....					81.60
Digestible protein in 100 lbs.....					9.50
Price per 100 lbs.....	$	$	$	$	$2.50
Cost of 1 lb. of dig. nutrients.....					.03
Cost of 1 lb. dig. protein.....					.26

2. Get the wholesale price of each of the four feeds considered in 1, as given in local newspapers, or use prevailing local prices. Insert these figures in the proper places in the outline given above.

3. Calculate the cost of 1 lb. of digestible nutrients in each feed, and insert these figures in the proper places. Carry your answers to two decimals. If the third decimal is five or more add 1 to the second decimal; if it is less than 5, drop it.

4. In like manner, calculate the cost of one lb. of protein in each of the feeds, as in article 3.

5. If time permits, make similar calculation with other feeds.

Questions

1. In which of the four feeds considered can you get 1 lb. of digestible nutrients for the least money?
2. In which can you buy protein at the lowest cost?
3. What is the cheaper feed, corn or oats?

To the Teacher.—These are good practical problems in arithmetic which 7th and 8th grade pupils should be able to work. Assign them for arithmetic and discuss the results in the agricultural period.

Have the pupils extend all calculations to two decimals. If the third decimal is 5 or more add 1 to the second decimal; if less than 5 drop it.

Exercise 6

HAECKER'S FEEDING STANDARDS

Object.—To learn how to calculate the amount of digestible nutrients dairy cows require, according to the results or standards Prof. Haecker established from experiments with feeding dairy cows.

Explanation.—After feeding trials with dairy cattle, Professor T. L. Haecker, at the Minnesota Agricultural Experiment Station, deducted that an animal weighing about 1,000 lbs. needed

For Maintenance 1000 Lbs.	Digestible Nutrients.		
	Protein	Carbohydrates	Fat
	Lbs. .70	Lbs. 7.00	Lbs. .10

per day to maintain its own weight, when the animal was not producing milk. He called this amount of required food, "food for maintenance."

If the animal was producing milk, he found that for each pound of milk produced per day, the animal needed the following additional amounts of food. This amount varied with the butter fat test of the milk. He called this additional amount "food for production."

Additional food requirements for 1 lb. of milk testing:

Test of Milk	Digestible Nutrients		
	Protein Lbs.	Carbohydrates Lbs.	Fat Lbs.
3%	.047	.20	.017
3.5%	.049	.22	.019
4%	.054	.24	.021
4.5%	.057	.26	.023
5%	.060	.28	.024
5.5%	.064	.30	.028
6%	.067	.32	.028

A. Calculating the Food Requirements for Maintenance.

Procedure.—1. The food requirements for the maintenance of an 800 lb. cow are:

Protein	Carbohydrates	Fat
.56 Lbs.	5.60 Lbs.	.80 Lbs.
.7 lbs. protein	.7 lbs. carbohydrates	.1 lbs. fat
×.8	×.8	×.8
.56 lbs. protein	5.60 lbs. carbohydrates	.80 lbs. fat

This is so because 800 lbs. is .8 of 1,000 lbs.

2. Calculate in like manner the food for maintenance required by a 900 lb. cow; by a 1250 lb. cow. Give the results in tabular form as shown above.

B. Calculating the Food Requirements for Production.

Procedure.—1. The feed requirements for the production of 20 lbs. of 4% milk are:

Protein	Carbohydrates	Fat
1.08 lbs.	4.80 lbs.	.42 lbs.
.054 lbs. protein	.24 lbs. carbohydrates	.021
×20	×20	×20
1.08 lbs. protein	4.80 lbs. carbohydrates	.42 lbs. fat

2. In like manner calculate the feed requirements for the production of 20 lbs. of 3.5% milk; for 30 lbs. of 5.5% milk. Give the results in tabular form as shown above.

C. Calculating the Food Requirements for Maintenance and Production.

Procedure.—1. According to the calculations given above an 800 lb. cow, producing 20 lbs. of 4% milk per day, would require in one day the following digestible nutrients:

	Protein lbs.	Carbohydrates lbs.	Fat lbs.
For maintenance, 800 lbs.	.56	5.60	.80
For production, 20 lbs., 4% milk	1.08	4.80	.42
Total requirements	1.64	10.40	1.22

2. In a similar manner calculate the total feed requirements for a

900-lb. cow producing 20 lbs. of 3.5% milk per day, also for a

1250-lb. cow producing 30 lbs. of 5.5% milk per day.

3. The calculations given above are used to aid in balancing, scientifically, rations for cows. Standards for other animals are used in exactly the same way. Another is given in Table 8, Appendix. If an animal requires in a day

Protein	Carbohydrates	Fat
1.64 lbs	10.40 lbs.	1.22 lbs.

its ration will be balanced when the feed it is fed in a day contains these three nutrients in the proportions given above.

Questions

1. Two cows weigh 1,000 lbs. each. One gives 20 lbs. of 4 per cent milk in a day, and the other 40 lbs. of 4 per cent milk; which one should be given the most feed?

2. Of two cows, one weighs 800 lbs., and the other, 1,200 lbs., and they both give the same amount of milk, testing 4 per cent; which is the more profitable cow?

To the Teacher.—The problems in this exercise constitute good work in arithmetic in the practical use of tables. Assign them for arithmetic work and discuss the results in agriculture. For a further discussion of them, see Bul. 130,

Feeding Dairy Cows. College of Agriculture, St. Paul, Minn., and Introduction to Agriculture, chap. 21.

Exercise 7

BALANCING RATIONS FOR DAIRY COWS

Object.—To learn how rations for dairy cows are scientifically balanced.

Explanation.—A balanced ration is one which supplies an animal with the proper amount of the three nutrients, protein, carbohydrates, and fat, in the proper proportions by weight. The feeding standards, based on many feeding trials, one of which was described in exercise 6, are our best authority for finding out what the needs of the animals are. If we know the needs, or total amounts of the three digestible nutrients an animal requires, and then feed that animal a suitable ration containing these digestible nutrients in approximately the same proportions by weight, the ration will be balanced.

Procedure.—1. Let us suppose that we have a 1,000 lb. cow which is producing 25 lbs. of 5% milk per day, and that we want to feed her a balanced ration according to the Haecker Feeding Standards.

2. The feed requirements for this cow are:

NUTRIENTS REQUIRED

	Protein lbs.	Carbohydrates lbs.	Fat lbs.	Total Nutrients lbs.
For maintenance, 1000 lbs.....	.70	7.00	.10	
For 25 lbs. of 5% milk	1.50	7.00	.60	
Total requirements.....	2.20	14.00	.70	17.58

The nutritive ratio of the requirements is 1 : 7.0.

3. Let us suppose that we have on hand red clover hay, corn silage, and ground barley, corn, and oil meal, and that by the use of these feeds we wish to feed the cow a balanced ration. As the data shows, these feeds, taken in the following amounts, approximately balance the requirements of the cow.

NUTRIENTS PROVIDED IN RATION.

Feed	Amount	Protein	Carbo-hydrates	Fat	Total Nutrients
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Clover hay.....	13	.92	4.91	.24	....
Corn silage.....	32	.40	4.54	.22	....
Corn ground.....	2	.16	1.34	.09	....
Oil meal.....	1	.30	.32	.07	....
Barley, ground....	2	.17	1.31	.03	....
Oats, ground.....	3	.32	1.51	.12	....
Nutrients provided.		2.25	13.93	.77	17.91
Nutrients required.		2.20	14.00	.70	17.58

The nutritive ratio of the food provided is 1 : 7.0.

4. The nutrients in the ration provided, approximately balance the nutrients required, and the ration is closely enough balanced for ordinary purposes. Calculations show that the total amount of digestible nutrients in the ration slightly exceed the amount in the requirements.

5. In like manner balance a ration for an 800 lb. cow producing 20 lbs. of 4% milk a day.

A few hints may not be amiss here.

In formulating rations—

Allow about 1 lb. of hay and 3½ lbs. of silage for every 100 lbs. of live weight, and 1 lb. of a good grain

mixture to each 3 to 4 lbs. of milk produced per day. If no silage is fed, allow 2 lbs. of hay for every 100 lbs. of live weight.

6. If time permits, balance a ration for a 1,200 lb. cow producing 30 lbs. of 4% milk per day.

"An Introduction to Agriculture," Chapter 21, gives a discussion of balanced rations. See Exercise 8, September, for calculating the total nutrients. See Exercise 5, October, for calculating the nutritive ratio.

Exercise 8

JUDGING POULTRY

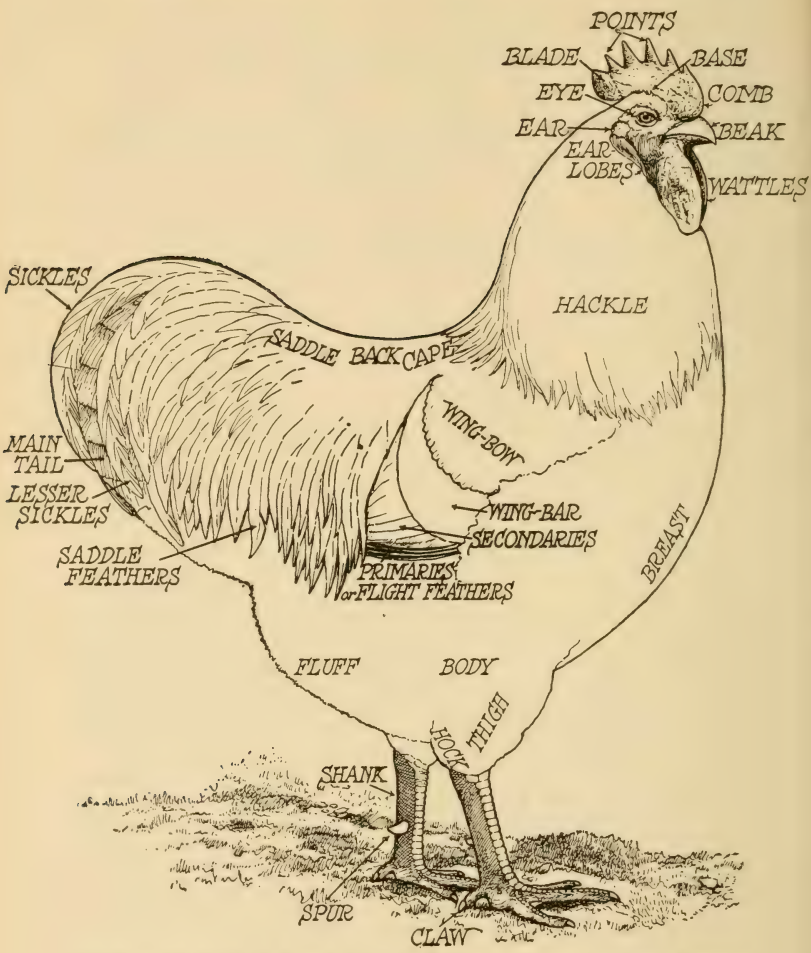
Object.—To learn how to judge poultry.

Explanation.—In communities which lay considerable stress on poultry raising, and where poultry clubs exist in the school, it will be advisable to take up this exercise. The school should be provided with a copy of "Standards of Perfection," published by the American Poultry Association, Chicago. Price $2.00. It is the most authoritative book on poultry judging, and gives full directions, disqualifications, and score cards for each breed.

Procedure.—1. Learn the names of the parts of a chicken as shown in the cut. Cover the names of the parts, and see if you can name them correctly.

2. Learn to know the characteristics of the different parts of a bird of the breed and variety you intend to judge. These are given in "Standards of Perfection."

3. With your teacher visit a farm where permission has been secured to judge a bird of the breed whose characteristics you have studied.



CUT SHOWING PARTS OF A GOOD MALE BIRD.—*Courtesy Missouri State College of Agriculture*

4. With the ideal in mind, proceed to judge the bird. Take up each point as it occurs on the score card.

Poultry Score Card

The score card is a means of directing the attention to the different parts of a chicken with the relative value given to each part. It does not propose to give a list of cuts, but rather to help one to judge by comparison. The following score card divides the bird into ten sections.

Breed ..... Variety .....
Sex ..... Weight .....

	Allowed		Cuts	
	Shape	Color	Shape	Color
1. Condition, weight and size.....	8	.....	.....	.....
2. Comb.....	10	.....	.....	.....
3. Head adjuncts.....	8	7	.....	.....
4. Neck.....	4	4	.....	.....
5. Back.....	6	6	.....	.....
6. Tail.....	6	5	.....	.....
7. Wings.....	5	5	.....	.....
8. Breast.....	5	5	.....	.....
9. Body.....	5	5	.....	.....
10. Legs and toes.....	3	3	.....	.....
Total.....	60	40	.....	.....

To the Teacher.—Very often the score card method of judging poultry is too difficult to undertake unless one has the assistance of a person who has judged poultry in like manner. Much may be gained by taking the class to places near the school where the pupils may observe and study some of the breeds of the four common classes of poultry. Let the pupils pick out in each flock a few birds which are good specimens of their breed. If you take up this exercise in this manner, have the class observe, and describe in their notes, the characteristics of each class and of each breed of poultry studied.

Exercise 9

DAIRY CATTLE BOOKLET

Object.—To make an illustrated booklet showing common breeds of dairy cows.

Procedure.—1. Read again Exercise 9, October "Poultry Booklet." The general plan of the dairy cattle booklet will be similar to that of the poultry booklet.

2. Suggested table of contents for a dairy cattle booklet.

SAMPLES OF GOOD DAIRY CATTLE BOOKLETS. TRY TO MAKE BETTER ONES.—*Courtesy Rural Students, Whitewater, Wis., Normal School*

TABLE OF CONTENTS

1. General characteristics of Dairy Cattle
2. Holsteins
3. Jerseys
4. Guernseys
5. Ayrshires
6. Brown Swiss
7. Dutch Belted

3. Devote page one of the booklet to the "Table of Contents," and pages 2 and 3, the two pages opposite each other at the same opening, to the general characteristics of dairy cattle, merely mentioning the different breeds in a columnar form. Illustrate your discussions.

4. Devote the next six pages to the six common breeds of dairy cattle,—one breed to a page with one or two illustrations for each breed.

5. Make a cover and bind the booklet as suggested in Ex. 9, Oct.

6. A beef cattle booklet may be made in a similar manner.

Exercise 10

DAIRY CATTLE SURVEY

Object.—To make a dairy cattle survey of the school district.

Procedure.—1. The following outline is suggested for the dairy cattle survey.

DAIRY CATTLE SURVEY.

School District No. ..... Town of..... Co.....

Date .....

Name of Farmer	Number of Cows			Number of		Breed
	Pure Bred	Grade	Scrub	Young stock	Sires	
1.						
2.						
3.						
4.						
Etc.						

For articles 2-3-4-5, see Exercise 10, October, and complete this exercise in same general manner as that on potatoes.

6. A similar outline may be used for beef cattle.

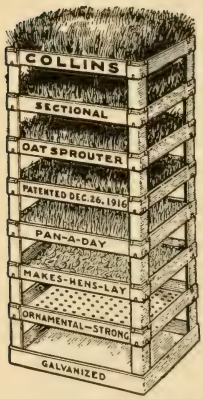
To the Teacher.—If the class makes a dairy cattle booklet, as outlined in previous exercise, this survey would be an interesting sheet to add to the booklet.

Project 1

SPROUTING OATS FOR LAYING HENS.

Object.—To sprout oats for laying hens during the winter months when no other green feed is available.

Explanation.—Green feed serves as an appetizer for all kinds of poultry. It adds variety to the ration, has good effect upon the digestive system, and also imparts a good yellow color to the yolk of the egg. During the greater part of the year, the free range supplies ample green feed, but during the cold winter months sprouted oats form a good substitute for the range. Do not undertake this project unless you have a warm cellar which contains a heating plant.



TRY YOUR HAND AT MAKING A RACK FOR TRAYS OF SPROUTING OATS.

Preparation.—1. Gather all the information you can about sprouting oats.

2. Try to see some manufactured or home-made oat sprouters. If it is possible, inquire also the method used in sprouting oats.

Procedure.—Make six or seven trays about 1½ or 2 inches high. For the ends and sides use ½ inch or ¾ inch wood strips. For the bottom of a tray use any light lumber, such as found in orange or soap boxes. A good size for the trays is 12 x 18 inches. This is large enough to supply oats for 30 or 40 hens.

2. Soak enough oats in a bucket of warm water over night to make a layer ¾ to 1 inch deep when spread out in a tray. The following morning drain off the water and spread the oats out in the tray.

3. Set the tray in a warm part of the cellar and sprinkle the oats with warm water every morning and night. Never let the oats get dry. In about two weeks the oats will have sprouted enough to be used as feed.

4. Every three or four days start a new tray, and keep the project going as long as you wish to feed sprouted oats.

5. If you start a tray every three days you will allow three days to feed the oats held in a tray, and since it takes about two weeks for these oats to get ready to be fed, you will need from four to six trays.

6. A rack may easily be made which will hold all the trays.

7. Keep accurate account of the amount of oats used in a month, and of your time, allowing yourself 15 cts. per hour. What does the sprouted oats cost a month?

Reference.—Poultry Production, Lippincott. Pages 353 and 354.

Project 2

WINTER MANAGEMENT OF A SMALL FLOCK OF PULLETS

Object.—To take entire charge of the management of a small flock, 6 or 12 pullets, during the winter.

Explanation.—This is an excellent project for an enterprising boy or girl during the winter. A small flock of March or April hatched chicks, fairly well mature by October, will begin to lay in November and continue to lay during the winter if the flock is properly fed and housed.

TWO GIRLS WHO FOUND MUCH ENJOYMENT IN TAKING CARE OF THE HOME FLOCK.—*Courtesy Iowa State Teachers' College.*

Procedure.—1. Before starting this project, one should have a clear and definite idea of the different factors essential to the successful winter management of a flock of poultry. The following topics should be studied and well understood and all preparations for housing made before the project is started.

a. What kind of a poultry house and how large a house do I need for my flock?

b. What interior fixtures should the house have?

c. What is a good winter ration? Is this ration balanced for egg production? What is its nutritive ratio?

d. From what source are the birds going to get animal protein?

e. How am I going to supply the birds with succulent and green feed?

f. How much scratch feed should I feed the birds?

g. What records ought I to keep?

h. Where am I going to get the pullets? What should I pay for them? How can I pick out good ones?

2. When all preparations have been made, get the birds and start the project.

3. Make an account book from a 5 or 10 cent composition book. Start with the opening inventory. See Exercise 8, October, and Project 1, October.

4. Keep accurate egg records and receipt and expense accounts. See Exercise 8, October.

5. Be sure to fill out the monthly summary sheet as suggested in Exercise 8, October.

6. At the close of the project, get the closing inventory and fill out the final summary sheet.

7. Get some one to feed the birds at noon and evening for you when in school.

8. Keep separate labor records, if you wish, and subtract the cost of labor from the profit over feed to get the net profit.

References.—F. B. 957: Poultry Diseases. F. B. 287: Poultry Management. F. B. 889: Poultry Keeping. F. B. 528: Hints to Poultry Raisers. Dept. Bul. 464: Lessons on Poultry for Rural Schools. 10 cents, Supt. of Public Documents.

See "An Introduction to Agriculture," Table 1, Appendix, Government Publications.

THINGS TO OBSERVE IN NOVEMBER

Different Breeds of Cattle	Winter Protection of Shrubs
Good Milk House	Model Dairy Barn
Root Cellar [Grafting	A Separator
Cuttings of Twigs for Spring	Seed Corn Curing Room

Exercise 1

TESTING MILK FOR BUTTER FAT

Object.—To find the per cent of butter fat in milk.

Explanat'on.—In testing milk for butter fat a definite amount of milk is mixed with a definite amount of acid in a graduated milk testing bottle. The acid dissolves all the constituents of the milk except the butter fat. The bottle containing the mixture of acid and milk is revolved in a Babcock tester which quickly separates the butter fat from the mixture. Hot water is then added to the bottle, and the mixture is revolved again. This action brings all the butter fat up into the graduated portion of the test bottle so that it can be measured. This test, known as the Babcock test, was invented by Prof. S. M. Babcock, of the Wisconsin State Agricultural College.

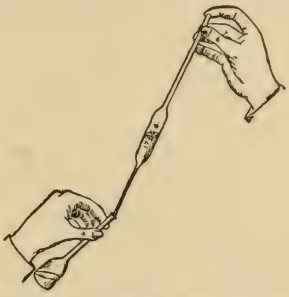
PIPETTE AND MILK TEST BOTTLE.—*Courtesy De Laval Separator Co.*

Materials—Babcock tester, milk test bottles, pipette, acid measure, sulphuric acid, samples of milk, two glasses, beaker, water bath, and thermometer.

Procedure.—1. The fundamental steps in testing milk are:

a. Sampling
b. Pipetting
c. Adding acid
d. Whirling and water adding
e. Heating in a water bath
f. Reading the test
g. Cleaning

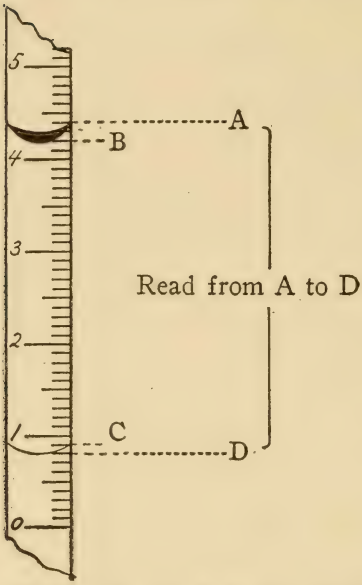
2. *Sampling.*—Stir well the milk you are to bring to school to test, before you take a sample of it. Use a pint Mason jar in which to carry the milk. When you are ready to test it, shake the jar gently to loosen the cream which may stick to the sides. Remove the cover and pour the milk back and forth in and out of a glass several times.



SHOWING PROPER WAY TO ADD THE MILK TO A TEST BOTTLE.—*Courtesy De Laval Separator Co.*

3. *Pipetting.*—Immediately draw milk into the pipette by suction with your mouth, to a point about ¼ of an inch above the circular mark on the neck of the pipette. Firmly press your tongue against the opening of the pipette so that you can place the forefinger of your left hand over the lower opening of the pipette and release the tongue. Then press the forefinger of the right hand firmly over the top opening of the pipette, and remove the finger at the lower end. A large drop of milk will fall from the pipette. Now replace the finger at the lower end, and remove the finger at the top for a moment and then replace. Release the finger at the lower end, as before. Continue this until the milk lowers to the mark. You have now 17.6 c.c. of milk, or 18 grams. Run the milk into the test bottle held at an angle.

4. *Adding Acid.*—Fill the acid measure to the mark, with the sulphuric acid used to test milk. Pour it carefully and slowly into the bottle, holding the same at a slant. Then mix the contents by a rotary motion, the mouth of the bottle being held away from the face. Keep on mixing the contents until all the curd has completely dissolved.



SHOWING HOW THE MILK TEST SHOULD BE READ.—*Courtesy Indiana Experiment Station*

5. *Whirling and Adding Water.*—Place the bottle in the tester, balancing with a similar bottle filled with milk or water on the other side. Whirl at the speed indicated on the machine for five minutes. Stop the machine, and with a beaker or acid measure, add boiling hot soft water to the bottle of milk you are testing until the fat is raised to the base of the neck. Whirl again for two minutes. Add more hot water slowly to bring the fat into the graduated portion of the neck of the bottle. Whirl for one minute.

6. *Heating in a Water Bath.*—Set the bottle in a hot water bath, having a temperature of 125° to 135° Fahrenheit, for ten minutes. If no water bath is available, proceed at once to article 7, reading the test.

7. *Reading.*—Read the fat column from the very bottom of lower end to the very top of the upper as shown in cut. Use dividers if you have them. Record the test.

8. *Cleaning.*—Empty the bottles, while hot, with continuous shaking to loosen the sediment in the bottom. Rinse the bottles with hot water.

Questions

1. Why is the testing of milk for butter fat important?
2. Why do many farmers weigh and test the milk of their cows?
3. If 100 lbs. of 3.5 per cent milk is worth $2.00, what would 100 lbs. of 5 per cent milk be worth if 4 cents is paid for each 1/10 per cent fat over 3.5 per cent.

Exercise 2

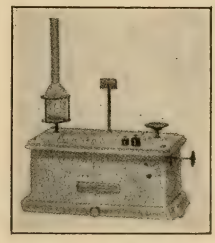
TESTING CREAM AND SKIM MILK FOR BUTTER FAT

A. TESTING CREAM

Object.—To test cream for the per cent of butter fat.

Materials.—Milk testing outfit, cream test bottles and cream balance.

A CREAM TEST BOTTLE. —*Courtesy De Laval Separator Co.*



A CREAM BALANCE.—*Courtesy De Laval Separator Co.*

Procedure.—1. Cream is tested for butter fat in almost the same manner as milk is. Cream test bottles must be used, and exactly 18 grams must be put in the bottles. For this purpose a sensitive cream balance must be used. Add the cream from a pipette to the bottle on the balance until 18 grams have been added.

2. The test is read from the bottom of the column of butter fat to the top of the meniscus, or upper curved surface, of the butter fat.

A SKIM MILK TEST BOTTLE. — *Courtesy De Laval Separator Co.*

B. TESTING SKIM MILK

Procedure.—1. In testing skim milk special double-necked bottles must be used.

2. 17.6 c.c. of the skim milk is added to the bottle with the pipette, but through the large neck, and the test is read on the narrow graduated neck.

3. Use 21 c.c. of sulphuric acid in testing skim milk.

QUESTIONS

1. Why is the neck of a cream test bottle larger than that of a milk test bottle?
2. What is gained by testing skim milk?
3. Why does a skim milk test bottle have two necks?
4. How would you write decimally $\frac{30}{100}\%$

To the Teacher.—There are for sale pipettes which have two circular marks around the upper portion. The lower mark designates the amount of milk to use in making a butter fat test, and the upper mark designates the amount of

cream to use. Such a pipette may be used in place of a balance to get the approximate test of the cream.

Exercise 3

DAIRY RECORDS AND COMPUTATIONS

Object.—To learn to keep dairy records and to figure the profit over feed cost of one or more cows for a month.

Materials.—Milk scales, and record sheets.

Procedure.—1. Make a milk record sheet as suggested below.

Month Date	Name of Cow	Name of Cow	Name of Cow	Name of Cow
1 A.M. P.M.				
2 A.M. P.M.				
3 A.M. P.M.				
Etc.				

Record the weight of the milk of each cow produced at each milking.

2. Make a feed record sheet as suggested below.

	Name of Cow			Name of Cow		
Date	Hay lbs.	Silage lbs.	Grain lbs.	Hay lbs.	Silage lbs.	Grain lbs.
1.						
2.						
3.						
4.						
Etc.						

Extend this form to the right according to the number of cows, and down for the number of days in the

month. Record the weight of the feed fed, weighing the ration once or twice a week.

3. About the middle of the month, test the milk of each cow by taking a little milk from the evening and morning milkings. Determine the weight of the milk produced during the first half of the month. Through your test of the milk determine also the amount of butter fat produced. Repeat at the end of the month. Get the totals for the month for each cow.

4. Get the total weight of each kind of feed for each cow for the month.

5. Make and fill out the suggested monthly summary sheets.

VALUE OF MILK—MONTHLY REPORT.

	Name of Cow	Lbs. of Milk Produced	Test	Lbs. of Fat	Value
1.					
2.					
3.					
Etc.					

FEED COST—MONTHLY REPORT.

	Name of Cow	Lbs. hay	Cost	Lbs. silage	Cost	Lbs. grain	Cost	Total cost of all feed
1.								
2.								
3.								
Etc.								

PROFITS OVER FEED—MONTHLY REPORT

	Name of Cow	Value of Product	Cost of Feed	Profit over Feed
1.				
2.				
3.				
Etc.				

To the Teacher.—The teacher should try to obtain milk and feed records of a small herd for a period of one to six months; and from these data have the class complete the records outlined above. It may be possible for some member of the class to get these records for the teacher, or to get the data from a tester, if there is a Cow Testing Association in the district.

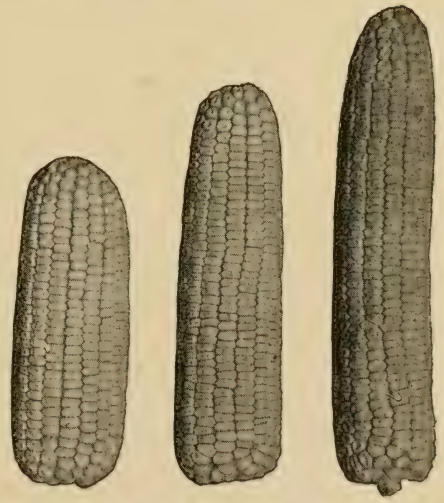
Exercise 4

PLACING THREE EARS OF CORN

Object.—To place or rank three ears of corn for each of the points mentioned on the score card.

Materials.—Three ears of corn and a score card.

Procedure.—1. Take three ears of some variety of corn and number them 1-2-3. This is done best by placing a rubber band around the center of each ear and then slipping under this band a small piece of paper on which the number is written.



THE MIDDLE EAR HAS THE MOST DESIRABLE SHAPE, LENGTH, AND CIRCUMFERENCE.—*Courtesy Wisconsin State Agricultural College*

2. In placing or ranking corn for all the points men-

tioned on the score card, you want to know which is the best, which is the second best, and which is the poorest, or in other words, how the ears rank,—first, second, or third, for each point mentioned. If ear three has the best tip, and ear one, the second best, the three ears

THE TIP ON THE RIGHT IS THE MOST DESIRABLE.—*Courtesy Wisconsin State College of Agriculture*

would rank 3-1-2 under the point, tips, meaning ear three has the best tip, and ear two the poorest.

3. As a guide for this work use the outline given for judging corn, Exercise 5, of this month.

4. Proceed in manner suggested above for each of the points on the score card and record your results in the form suggested.

FORM OF RECORD FOR PLACING CORN

Points to Consider	Sample 1			Sample 2		
	First	Second	Third	First	Second	Third
1. Type and Uniformity...						
2. Maturity and Market Condition.....						
3. Purity (a) Kernel..... (b) Cob.....						
4. Shape of Ear.....						
5. Length of Ear.....						
6. Circumference of Ear...						
7. Shape of Kernel.....						
8. Uniformity of Kernel						
9. Character of Germ.....						
10. Butts.....						
11. Tips.....						
12. Space between Rows....						
13. Size of Cob.....						

5. Place another sample of three ears, in like manner. Let the second sample be one that some other member of the class placed. Compare and discuss your results with his. Did you agree on all points?

6. Which was the best ear of each sample you placed? Tell why.

THE SECOND EAR IS THE BEST FROM EVERY STANDPOINT.—*Courtesy Wisconsin Agricultural Experiment Station*

Exercise 5

A. JUDGING CORN

Object.—To judge by means of a score card a ten ear sample of corn.

Materials.—Ten ears of corn, ruler or tape, and a score card.

Explanation.—In judging corn, ten ears are generally

used. The defects of each ear for each point mentioned on the score card are determined and charged against it, as deductions or cuts from the amount of the perfect score.

A WELL SELECTED AND WELL ARRANGED TEN-EAR SAMPLE.—*Courtesy U. S. Department of Agriculture*

Procedure.—1. Arrange the ten ears in a systematic order, largest ear to the left. Number the ears 1 to 10. Two or three pupils may work together on one sample, one pupil recording the cuts, another the score, and the third, handling the corn.

CORN SCORE CARD

SCALE OF POINTS	No. of Sample				
1. Type and Uniformity	10				
2. Maturity and Market Condition	10				
3. Purity (a) Kernel	5				
(b) Cob	5				
4. Shape of Ear	10				
5. Length of Ear	10				
6. Circumference of Ear	5				
7. Shape of Kernel	5				
8. Uniformity of Kernel	5				
9. Character of Germ	10				
10. Butts	5				
11. Tips	5				
12. Space Between Rows	5				
13. Size of Cob	10				
Total	100				

VARIETY STANDARDS

Recognized Varieties:

Yellow	Length	Circumference
Reid's Yellow Dent	10 to 10½	7¼ to 7½
Leaming	10 to 10½	7½ to 7¾
Legal Tender	10 to 10½	7¼ to 7½
White		
Boone County White	10½ to 11	7½ to 7¾
St. Charles White	10 to 10½	7¼ to 7½

Other Varieties:

Yellow	Length	Circumference
Cartner	9 to 9½	7¼ to 7½
St. Charles Yellow	10½ to 11	7¼ to 7¾
White		
Silvermine	9 to 9½	7 to 7¼
Johnson Co. White	10½ to 11	7½ to 7¾
General Entries	9½ to 10½	7¼ to 7¾
Variety Judged		

2. Use the guide in determining the cuts. Judge all ten ears for the first point mentioned on the score card. If ear 1 does not closely correspond in all particulars to the variety or type of corn being judged, and if it does not resemble in a general way the remaining nine ears, it should be cut for "Type and Uniformity." How much? Use your own estimation. It may be cut all the way from 1/10 of a point to 1 point. Study ear two in the same manner, then ear three, and so on. Add the cuts for the ten ears. Subtract this total from the perfect score mentioned on the score card and record the difference in the proper place on the score card.

3. In like manner judge the 10 ears for the second point, "Maturity and Market condition"; then for the third point and so on to the end.

4. If time permits, when you have judged a sample of 10 ears, exchange your sample with some other member of the class who has judged ten ears and then compare results.

GENERAL GUIDE FOR JUDGING CORN

Things to Consider	Guide for Cuts.
1. All ears should be alike. Color of kernels and of cob, and shape and indentation of kernels should resemble the variety.	Cuts from .1 to 1.0 for each ear showing any differences.
2. Corn should be mature and be of grade 1. See grading corn at end of this exercise.	Cut from .1 to 1.0 for each immature ear and for each ear not good enough for grade 1.
3. a. True to variety. No discolored kernels. b. Cherry red for yellow corn. Glistening white for white corn.	Cut from .1 to .5 for each ear showing discolored kernels. Cut from .1 to .5 for each cob off color.
4. Should be cylindrical, not crooked or tapering. See illustration.	Cut from .1 to 1.0 for each ear not cylindrical.
5. See notes on score card.	Add excess and deficiencies of the ten ears together and cut 1 point for each inch.
6. See notes on score card.	Cut as for 5.
7. Wedge shape, not pointed, deep.	Cut from .1 to .5 for each ear showing poorly shaped kernels.
8. Alike in size and shape. Uniform on each ear.	Cut from .1 to .5 for each ear showing uniform kernels.
9. Should be smooth and bright.	Cut from .1 to 1.0 for each ear having kernels whose germs are shriveled or discolored.
10. Not contracted or enlarged. Kernels in regular rows. Shank of medium size.	Cut from .1 to 1.0 for each ear having a defective butt.
11. Rounded. Completely covered with uniform kernels in regular rows.	Cut from .1 to .5 for each ear.
12. No space between kernels in the row at the cob or at the crown of the kernels.	Cut from .1 to .5 for each ear.
13. Medium size. Large cob and shallow kernels gives a low percentage of corn. Percentage of corn 86.	Cut from .1 to 1.0 for each ear having a large cob.

B. MARKET GRADES OF CORN

Explanation.—Only shelled corn is shipped to the large markets. When a carload arrives at a market, a sample is taken by a State Grain Inspector. He sends

this sample to the state laboratory where it is graded. Then the whole carload, from which the sample has been taken, is given the grade allotted to the sample. The value of the corn is determined by the grade into which it is put. Daily papers usually publish the current wholesale selling price of each grade of corn. The market grades of corn are here given.

RULES FOR GRADING CORN.

The following maximum limits shall govern all inspection and grading of corn:

Grade Classification White, Yellow and Mixed Corn	MAXIMUM PERCENTAGES OF			
	Moisture	Damaged Corn	Foreign material, including dirt cob other grains, finely broken corn, etc.	"Cracked" corn, not including finely broken corn.
No. 1.....	14.0	2	1	2
No. 2.....	15.5	4	1	3
No. 3.....	17.5	6	2	4
No. 4.....	19.5	8	2	4
No. 5.....	21.5	10	3	5
No. 6.....	23.0	15	5	7
"Sample"	See General Rule No. 5 for Sample Grade.			

General Rules.—1. The corn in grades No. 1 to No. 5 inclusive must be sweet.

2. White Corn, all grades, shall be at least 98 per cent white.

3. Yellow Corn, all grades, shall be at least 95 per cent yellow.

4. In addition to the various limits indicated, No. 6 corn may be musty, sour, and may also include corn of inferior quality, such as immature and badly blistered.

5. All corn that does not meet the requirements of either of the six numerical grades by reason of an excessive percentage of moisture, damaged kernels, foreign

matter or "cracked" corn; or corn that is hot, heat damaged, fire burnt, infested with live weevil, or otherwise of distinctly low quality, shall be classed as sample grade.

6. Moisture percentages, as provided for in these grade specifications, shall conform to results obtained by the standard method and tester as described in Circular 72, Bureau of Plant Industry, U. S. Department of Agriculture.

Procedure.—1. Grade a quart sample of shelled corn. To do this, take a handful of the corn, spread this out on the desk, and follow the directions given in the Rules for Grading Corn, omitting the moisture test.

2. Into what grade did you put the corn? Why?

To the Teacher.—A booklet on market grades of corn and other grains can be secured, free of charge, from the Illinois State Grain Inspection Department, Chicago, Illinois.

Exercise 6

STRUCTURE OF SEEDS

Object.—To make a study of a kernel of corn and of a lima bean seed.

Materials.—Soaked kernels of corn and soaked lima bean seeds.

A. CORN

Procedure.—1. Make an enlarged drawing of a kernel of corn with the germ, or depressed side, toward you.

2. Cut a soaked kernel of corn lengthwise through the center. Draw a picture of the cut surface and label the endosperm, cotyledon, stem, and root.

3. Cut another kernel crosswise in three regions,—one

above the little stem, one through the stem, and a third through the region of the little root. Make an enlarged drawing of the lower surface of each of the first three cut sections. Label all parts.

4. What is the function of each part of the kernel?

B. LIMA BEAN

Procedure.—1. Make an enlarged drawing of the side view of a lima bean seed.

2. Carefully remove the seed coat of a soaked lima bean, being careful not to break off of the seed, the small, peg-shaped structure. Draw the seed as you see it now.

3. Carefully remove one of the cotyledons so as to leave the little, peg-shaped structure, or root, and the small structures, or leaves, between the cotyledons, attached to one cotyledon. Draw the inner surface of this cotyledon showing the little immature plant attached to it. Label parts.

4. How does a bean seed differ from a kernel of corn?

To the Teacher.—A few days before you take up this exercise with the class, soak in a glass of water enough navy bean seeds and kernels of corn to supply the class.

Exercise 7

EXAMINATION OF FARM SEEDS

Object.—To become familiar with the characteristics of a number of farm seeds, such as clover, alfalfa, timothy, etc.

Materials.—One ounce samples of three or four common farm seeds.

Procedure.—1. Place a small teaspoonful of each seed sample on a sheet of white paper.

2. Separate the large, plump seeds from the small, shriveled, or broken seeds, and from other material. Make four groups out of each sample as:—1. Large seeds; 2. small or broken seeds; 3. weed seeds; 4. inert matter as chaff, dirt, etc.

3. Briefly describe the sample you have examined.

4. In like manner examine other samples. Through such exercises as this, learn to detect the difference between high grade and low grade seed.

Questions

1. Does it pay to buy low grade seed? Why not?
2. How are seeds commonly cleaned?
3. Should oats, wheat, and other large seeds be cleaned before they are used for seed?

To the Teacher.—Some of the members of the class may be able to bring enough of two or three kinds of small farm seeds for this study. If not, buy some from a local merchant, or send to a seed dealer. See list, Exercise 8, February.

Exercise 8

DIGESTIBLE NUTRIENTS FROM AN ACRE OF LAND

Object.—To learn how to find out how many pounds of total digestible nutrients an acre, sown to one of the few common crops, produces.

Materials.—Table showing the amount of digestible nutrients in feeds. See table 1 in the Appendix.

Procedure.—1. If the yields of crops indicated below

could be grown on one acre of land, which crop would produce the greatest amount of total digestible nutrients?

2. To answer this question review Exercise 8, September, and then fill out the following table:

Crop	Yield per Acre	Lbs.	Lbs. of Digestible Protein	Lbs. of Digestible Carbo-hydrates	Lbs. of Digestible Fat	Total Lbs. of Diges-tible Nutrients (Fat x 2¼)
Alfalfa hay	3 tons	6000				
Red clover hay	1½ "					
Timothy hay	1 "					
Corn silage	8 "					

QUESTIONS

1. Which of the crops mentioned above gives the largest amount of digestible nutrients per acre?

2. Which crop gives the largest amount of protein per acre?

3. Can you suggest what crops it would be most profitable to grow on a small dairy farm?

To the Teacher.—Consult Exercise 8, September, for calculating "Total Pounds of Digestible Nutrients." This exercise may be assigned for arithmetic work and the results discussed in the agriculture class.

Exercise 9

THE INFLUENCE OF DRAINAGE ON PLANT GROWTH

Object.—To illustrate how the drainage of free water from the soil benefits plant growth.

Explanation.—This is a class exercise. Assist in preparing the material. Describe each step under procedure in your notes.

Materials.—Four large empty tin cans.

Procedure.—1. Fill two empty cans, without any holes in the bottom or sides, with a rich light garden soil and plant in each can ten wheat or oat grains.

2. With a nail and hammer make eight or ten small holes in the bottoms of the other two tin cans and a few more holes around the sides of the cans near the bottoms. Fill these cans with the same soil as you did the first two cans. Plant the same number and the same kinds of kernels in each of these cans that you did in the others.

3. Keep all the cans in a warm room, and about twice a week add exactly the same amount of water, ½ to 1 cupful, to each can.

4. After three or four weeks, describe the results and account for the differences.

Questions

1. Why is good drainage necessary for the best growth of plants?

2. How are wet fields generally drained?

Exercise 10

GRAIN SURVEY

Object.—The object of this exercise is to find how much wheat, oats, barley, and rye are raised in the school district.

Procedure.—1. The following outline is suggested for this survey:

GRAIN SURVEY

Farmer		Wheat		Oats		Barley		Rye	
		Acres	Yield	Acres	Yield	Acres	Yield	Acres	Yield
			Bu.		Bu.		Bu.		Bu.
1.									
2.									
3.									
4.									
Etc.									

2. Copy this outline on the board and proceed with the survey as outlined in Exercise 10, October.

3. Finally fill out the following suggested record for the totals of each crop.

	Wheat	Oats	Barley	Rye
Acres.....				
Yield.....				
Yield per Acre.....				

4. How do the yields per acre of these crops in the district, compare with the yields of the same crops per acre in the county? In the state? Your state abstract from the U. S. census will give the average yields per acre of your county and your state.

Project 1

KEEPING DAIRY FEED RECORDS

Object.—To keep a feed record of one or more cows for a month.

Explanation.—With the work thus far outlined in feeding animals, Ex. 5 and 6 in October, and Ex. 5, 6, 7 in November, it should not be difficult to figure the amount of the different kinds of feed fed one or more cows in a month, and to ascertain the cost of the month's feed.

Preparation.—1. Find out simple ways of weighing the different feeds and provide milk scales or spring balances for weighing the feed.

2. Prepare simple record sheets for recording the weight of each kind of feed as suggested in Exercise 3 of this month.

Procedure.—1. When the feed is measured out for the animal, weigh it and record the weight of each kind of feed. See Exercise 3, December.

2. It will not be necessary to weigh the feeds at each feeding, if the proportions remain the same, but whenever a change is made, be sure to get the accurate weights of the changed feeds.

3. Calculate the total amount of each kind of feed fed each animal during the month.

4. Calculate the cost of each kind of feed for a month, using current prices.

5. Get the total cost of the feed for each animal for a month.

Reference.—S. R. S. Doc. 38: U. S. Dept. of Agriculture, Farm Records and Accounts.

Project 2

TO KEEP MILK AND BUTTER FAT RECORDS OF THE HOME HERD

Object.—To find out how much milk and how much butter fat each cow in the home herd produces in a month.

Preparation.—1. Review Exercise 3 of this month.

2. Prepare a milk record sheet as suggested in Exercise 3, and make preparations for weighing the milk.

3. Review Exercise 1 of this month, and make preparations for sampling and testing the milk.

Procedure.—1. Weigh the milk of each cow at each milking and record each weight in its proper place on the milk record sheet.

2. On the fifteenth day of the month, take a sample of the mixed morning and evening milk of each cow in a bottle, and test this sample for the per cent of butter fat. Review Exercise 1, December. Find out how much milk and how much butter fat each cow has produced in the first half of the month.

3. Repeat the work for the last half of the month.

4. Determine the total records for the month.

THINGS TO OBSERVE IN DECEMBER

A good laying flock.
A good producing herd.
The making of butter and cheese.
A good swine house.
Well protected farm implements.
How snow protects winter crops.
Action of ice in forming soil particles.

JANUARY

Exercise 1

HOW SEEDS GERMINATE

Object.—To see how seeds germinate and begin to grow.

Materials.—Two pie plates, two pieces of cloth, and about five kernels each of corn, wheat, oats and five bean seeds.

Procedure.—1. Place several thicknesses of a clean and damp cloth in the bottom of one of the pie plates.

2. Scatter a few of the four kinds of seeds over this, and cover with another plate.

3. Set the plates aside in a warm place and keep the cloths moist.

4. In about four or five days the seeds will begin to germinate. Study them and learn how they begin to grow.

5. Draw bean seedlings in different stages of growth.

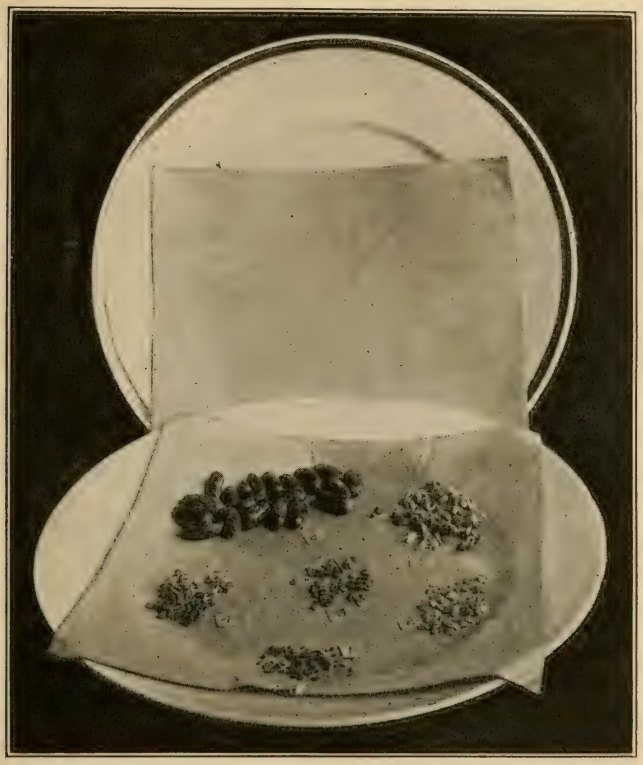
6. Repeat 5 for corn or wheat.

QUESTIONS

1. Which of the seedlings studied would have had the most difficulty in breaking through the soil?

2. Through what kind of a soil can beans break most easily, a light soil or a heavy soil? Why?

To the Teacher.—Have the class do this work at home and bring the plates with the germinated seeds to school to study the results and to make drawings.



ILLUSTRATING THE PLATE TESTER IN USE.—*Courtesy Indiana Agricultural Experiment Station*

Exercise 2

CANDLING EGGS

Object.—To learn how to candle eggs and to be able to tell a bad egg.

Materials.—An empty shoe box or a round Quaker Oats box, or a special egg tester. Lamp or Electric light.

Procedure.—1. Make an egg tester as is shown in the cut. An empty shoe box or a round Quaker Oats box, which will fit over a lamp is all that is needed. Make several holes in the bottom of the box, to admit air. The hole in the side should be smaller than an egg and on a level with the flame of the lamp. The top of the box should extend above the top of the chimney. An egg tester from an incubator may take the place of the box.

2. If electricity is available, an electric light may take the place of the lamp, and the bottom and top of the box may be air tight.

3. Night is the best time to candle eggs.

4. Spoiled eggs and eggs having blood spots will show dark masses in the region of the yolk. Good eggs will appear clear before the light.

5. Practice candling fresh, stale, and bad eggs and thus learn to tell fresh and good eggs from stale and bad ones.

Questions

1. Why should eggs be tested?
2. How can you tell a stale egg from a fresh egg?
3. Are eggs showing blood spots suitable for cooking purposes?

To the Teacher.—Demonstrate to the class how to test eggs, so that they may be able to make practical use of this exercise at home. Testers coming with incubators may be used if available.

A COMMON AND SIMPLE METHOD OF CANDLING EGGS.—*Courtesy Missouri Poultry Experiment Station*

Exercise 3

TO STUDY THE EFFECT OF LIME ON CLAY

Object.—To see how lime causes fine soil particles to gather into small masses.

Materials.—Two glasses or large mouthed bottles. Samples of clay or loam soil. Lime or lime water.

Procedure.—1. Add one or two tablespoonsful of a clay or loam soil to each of two glasses or bottles of water.

2. Stir or shake these well. Add a teaspoonful of powdered lime, or several tablespoonsful of limewater to one of the glasses or bottles and stir well.

3. What difference do you see in the way the soil particles settle, and the way the liquids clear up?

4. The lime causes the particles of clay in the soil to form into tiny clusters and these settle more readily. The process of forming these particles is called flocculation. Clay soils are greatly improved by lime. The clustering of the particles makes the soil more porous, and this is a benefit both because it allows air and water to enter the soil more readily, and because it tends to keep the soil from baking, and, therefore, makes the soil more suitable for plant growth.

Questions

1. For what purpose is lime usually added to soils?
2. What class of crops are most benefited by lime?

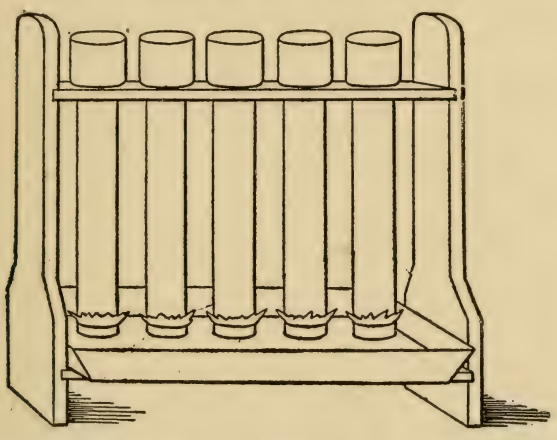
Exercise 4

RISE OF WATER IN SOILS

Object.—To show how water rises in different kinds of soil and in soil materials.

Explanation.—This is a class exercise in which the entire class should assist. Each member of the class should follow the outline when writing up the experiment.

Materials.—About six tall lamp chimneys, cheese cloth, sand, fine gravel, and samples of different classes of soils. Frame to hold the lamp chimneys.



DEVICE SHOWING THE MOVEMENT OF WATER IN SOIL.—*Courtesy U. S. Department of Agriculture*

Procedure.—1. Assist in making a rack as illustrated in the picture, to hold five or six lamp chimneys.

2. Tie a piece of cheese cloth over the end of each chimney.

3. Fill one chimney with fine gravel, one with sand, and the others with different classes of soils, all air dried.

4. Place the chimneys, cheese cloth end downward, in the rack so that the lower end of each chimney sinks

about one inch into a pan of water or into a glass of water under each.

5. Note the difference in the rate and extent of rise in each chimney for one hour, two hours, four hours, and a day. Record the results in tabular form.

6. How do you account for the differences in the rate and extent of the upward movement?

7. This upward movement is due to capillary attraction and we commonly speak of the rise of the water as capillary rise.

Exercise 5

HOW TOO MUCH VEGETABLE MATTER CHECKS CAPILLARY RISE OF WATER

Object.—To show how a layer of vegetable matter separating two layers of soil checks the capillary rise of water.

Explanation.—This exercise should be worked by the class as a whole, each pupil assisting the teacher in getting the materials ready. Each member of the class should write up the experiment, and answer the questions.

Materials.—Same as used in previous experiment and a handful of cut straw or hay.

Procedure.—1. Fill one chimney again with soil similar to that used in the previous experiment in which the water rose to the top.

2. Fill another half full with the same soil and then put in a handful of cut straw or hay to make a layer about 1 inch thick. Upon this, pour enough of the

soil to fill the chimney. Set both chimneys in water as before.

3. Note the difference in the extent of the rise of the water in the two chimneys.

4. What may be the effect upon a field of plowing under too much grass or undecayed vegetable matter?

Questions

1. What would happen in 2, under Procedure, if the vegetable matter and soil were well mixed?

2. Describe instances when a farmer may plow under too much vegetable matter.

Exercise 6

TO SHOW HOW SOIL WATER ENTERS THE ROOTS OF PLANTS

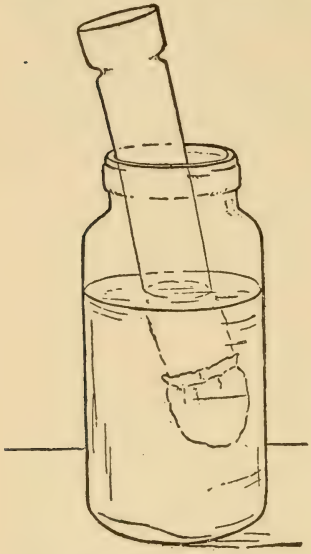
Object.—To illustrate the process of osmosis, or how soil water enters the roots of plants.

Explanation.—Two or three pupils working together should be able to set up the materials for this exercise. Each pupil should follow the outline in writing up the experiment. This process may also be illustrated by putting a slice of a potato into salt water and another slice into clear water. Here the movement in and out of the potato is illustrated.

Materials.—1. Lamp chimney, Mason jar, skin of a Bologna sausage, and a thick solution of molasses.

Procedure.—1. Remove the contents of a link of Bologna sausage, being careful not to rupture the skin. Soak the skin in water a few minutes to remove all the meat particles.

2. Tie a piece of the skin tightly over the small end of the lamp chimney (as shown in the illustration). Pour water into the chimney to test how securely you have fastened the skin. It should not leak.



DEVICE FOR SHOWING OSMOSIS.—*Courtesy Massachusetts Department of Agriculture*

3. Empty the chimney of water and half fill it with a thick solution of molasses, and place the chimney in a Mason jar nearly filled with water.

4. Set the apparatus to one side and note the rapidity and height to which the liquid rises in the chimney.

5. The passage of water through the skin into the molasses is called osmosis. Soil water enters the roots of plants by the process of osmosis. (Your physiology book may explain this process.)

Questions

1. What would happen if the molasses solution were in the jar and the clear water were in the chimney?

2. Would plants absorb water from a soil in which there was an over-abundance of soluble plant food?

Exercise 7

PLANT FOOD REMOVED BY CROPS

Object.—To learn to be able to find out how many pounds of nitrogen, phosphorus, and potassium are taken by crops from the soil when a crop is harvested.

Materials.—Table showing the amount of plant food contained in farm crops. See Table 2, Appendix.

Procedure.—1. Let us assume that during a period of four years we are harvesting from one acre of land the four crops mentioned in the following:

POUNDS OF PLANT FOOD REMOVED PER ACRE

	Crop	Yield	Weight	Nitrogen Removed	Phosphorus Removed	Potassium Removed	Value of Plant Food
			Lbs.	Lbs.	Lbs.	Lbs.	
1	Corn	50 bu.					
2	Corn stover	1¼ tons					
3	Total						
4	Wheat	20 bu.					
5	Wheat straw	1 ton					
6	Total						
7	Clover hay	1½ tons					
8	Timothy hay	1 ton					

2. Determine the weight of these crops in pounds and, with the aid of Table 2 in the Appendix, determine the amount of plant food removed by each crop. Make no charge for nitrogen in the clover crop because it is assumed that the nitrogen it contains comes indirectly from the air in the soil by the action of bacteria.

3. Find the cost of each element of plant food removed by each crop, assuming that a pound of nitrogen is worth 20 cents, a pound of phosphorus 6 cents, and a pound of potassium 10 cents. Record your results in the last column.

4. Which crop removed the most plant food?

5. How can this amount of plant food be returned to the soil?

QUESTIONS

1. Is it necessary to put plant food back into the soil?

2. What would ultimately be the result if no plant food were put back into the soil?

3. What materials do farmers in your community add to the soil to replace the plant food removed?

4. What is the approximate cost of a pound of each of these three elements in a complete fertilizer. (Find out from a local fertilizer dealer.)

To the Teacher.—This is a good practical problem in arithmetic involving the use of a table. Assign the exercise for arithmetic work and discuss the results in the agriculture class.

Exercise 8

PLANT FOOD ADDED TO SOILS

Object.—To learn to be able to find out how much plant food is added to an acre of land.

Materials.—Table showing the amount of plant food in manure and in commercial fertilizers. See Tables 2 and 3 in Appendix.

Procedure.—1. Let us assume that a farmer adds 10 tons of average farm manure and 400 lbs. of phosphate rock to an acre of land in four years. How much plant food is added? Complete the following table. Refer to Tables 2 and 3 in the Appendix.

POUNDS OF PLANT FOOD ADDED PER ACRE

Material	Nitrogen	Phosphorus	Potassium
	Lbs.	Lbs.	Lbs.
10 tons manure.....			
400 lbs. phos. rock.....			
Total added.....			

2. Does the amount of plant food added equal that removed in the four years of cropping in the previous exercise?

3. Below are given the important factors necessary for the maintenance of soil fertility:

1. Raise live stock
2. Rotate the crops
3. Grow clover, alfalfa and other legumes
4. Save the barnyard manure
5. Pasture rolling lands to prevent washing
6. Add humus—don't burn the stalks
7. Supply needed elements.

—*International Harvester Co.*

In place of the elements of plant food nitrogen, N, phosphorus, P, and potassium, K, the term ammonia NH_3, "phosphoric acid" P_2O_5, and potash K_2O, are often used. These last three substances are simple compounds containing elements nitrogen, phosphorus, and potassium. To change:—

Nitrogen to Ammonia, multiply by 1.2
Phosphorus to "phosphoric acid" multiply by 2.3
Potassium to potash, multiply by 1.2.

Exercise 9

CROP ROTATIONS

Object.—To make an outline of a number of crop rotations.

Explanation.—

WHY CROP ROTATION IS PROFITABLE

1. Helps maintain soil fertility
2. Improves physical condition of soil
3. Combats weeds, insects and plant diseases
4. Prevents washing of soil
5. Furnishes a variety of feed
6. Distributes farm work throughout the year
7. Leads to live stock farming
8. Insures against crop failure
9. Means living on the farm.

A COMMON FOUR YEAR ROTATION

Field	First Year	Second Year	Third Year	Fourth Year
A	Clover	Mixed Hay	Corn	Small Grain
B	Mixed hay	Corn	Small grain	Clover
C	Corn	Small grain	Clover	Mixed hay
D	Small grain	Clover	Mixed hay	Corn

Courtesy Wisconsin Agricultural Experiment Station

Procedure.—1. An outline for a common three year rotation of corn, oats, and clover is:—

	Field A.	Field B.	Field C.
First year.....	corn	oats	clover
Second year.....	oats	clover	corn
Third year.....	clover	corn	oats

2. Make a similar outline for a four year rotation.

3. For a five year rotation.

4. Make an outline of some of the rotations practiced in your community.

QUESTIONS

1. How does the rotation of crops help in maintaining soil fertility?

2. How does crop rotation improve the physical condition of the soil?

3. How does the rotation of crops combat weeds, insects, and plant diseases?

Exercise 10

FARM CROP BOOKLET

Object.—To make an illustrated booklet describing the common farm crops of the community.

Materials—An old seed catalog.

Procedure.—1. Read again Exercise 9, October, "Poultry Booklet." Follow these directions, making them applicable to a farm crop booklet. Cut your illustrations from an old seed catalog. Devote one or two

SAMPLE OF GOOD AGRICULTURAL BOOKLETS.—*Courtesy International Harvester Co.*

pages to each crop, and include all the important crops of the community.

Exercise 11

SILO SURVEY

Object.—To find out how many silos there are in the school district.

Procedure.—1. Read Exercise 11 in September and Exercise 10 in October. Follow the same general directions and gather the data suggested below, in making the silo survey.

SILO SURVEY

School District No..... Town of..... Co.....

Date.....

Name of Farmer	Kind of silo	Diameter ft.	Height ft.	Capacity in tons	Acres required to fill
1.					
2.					
3.					
4.					
Etc.					

Project 1

CHECKING UP THE HOME HERD

Object.—To find out the value of the milk which the cows of a herd are producing in a period of six months or a year, to find out the cost of the feed fed to these cows during this same period, and finally, to find out the profit each cow is making over the cost of her feed.

Explanation.—In this project we are going to try to do exactly what a cow testing association does. There are two parts to the project, keeping the milk and butter fat records, and keeping the feed records. The work of these parts has been explained in Exercise 3, December.

Preparation.—1. Study Exercise 1, December, again.

2. Learn how to keep feed and milk records.

3. If possible, study the records of a member of a cow testing association. Get a milk weighing scales for weighing the milk and feed.

4. Make the feed and milk record sheets. See Exercise 3, December.

5. Tack these up in a convenient place.

Procedure.—1. Weigh the milk of each cow at each milking and record the weight in the proper place on the milk sheet.

2. Find out what the daily ration for each cow is and record this on the feed sheet. Get the current price of each feed to make the proper charges.

3. Once or twice a month, test the milk, and determine the amount of fat each cow has produced, as suggested in Project 2, December. Keep posted on the selling price of milk or cream. With these figures, find the value of each cow's milk product for each month.

4. Determine, monthly, the cost of feed per cow. Keep posted on the market value of feeds. See Project 1, December.

5. Determine the profit over the cost of feed per cow for each month, also the profit over the cost of feed for each cow for the entire period. See Exercise 3, December.

THINGS TO OBSERVE IN JANUARY

Silos and silage
Ventilating systems in barns
Commercial egg candling
Wintering of beehives
Care of farm manure
Wind breaks
A cow tester at work

FEBRUARY

Exercise 1

WATER CAPACITY OF SOILS

Object.—To show that different classes of soils vary in the amounts of water they can hold and that decayed vegetable matter increases a soil's power to hold water.

Explanation.—This is an exercise to be worked by the class as a whole. Each member of the class is supposed to assist in getting the apparatus ready and to help in the working of the experiment. Each member, also, should briefly write up an account of the experiment, fill out the table, and answer the questions.

Materials.—Samples of sand, loam soil, clay soil, leaf mold or peat, five tin cans, a spring balance, a nail, and a hammer.

Procedure.—1. With a nail and hammer punch 8 to 10 small holes in the bottom of each of the five tin cans. Also punch two holes in the tops on opposite sides. Run a strong string between these top holes, that you may be able to weigh the can. You may, in this exercise, use the lamp chimneys used in Exercise 4, January, in place of the tin cans if desired.

2. Weigh each can with a spring balance. Record the weight in the tabulated suggested form. After weighing, fill each can two-thirds full, respectively, with

sand, loam soil, clay soil, leaf mold or peat, and with one-half sand and half leaf mold or peat, and weigh each again. Record weights.

3. Add water to each can until its contents are thoroughly wet. Allow all the free water to drain off; then weigh each can again. Record weights.

	Sand	Loam	Clay	Peat	Sand and Peat
1. Weight of can.....					
2. Weight of can and soil.....					
3. Weight of soil.....					
4. Weight of both with water...					
5. Weight of water retained.....					
6. Per cent. of water retained...					

5. Which material held the most water? What was the per cent of increase in the amount of water held when peat or leaf mold was added to the sand? Would manure increase the water capacity of a soil?

Exercise 2

DOWNWARD MOVEMENT OF WATER IN SOILS

Object.—To study the rate of the downward movement of water in soils and to show how this can be increased and decreased.

Explanation.—This is a class exercise. Each member should assist in getting the apparatus ready, and in performing the experiment. Also, each pupil in the class should write up briefly the experiment, copy the table, insert the obtained data, and answer the questions.

Materials.—Five lamp chimneys used in Exercise 4, January, or five tin cans used in the previous exercise. Sand, loam, clay, peat or leaf mold.

Procedure.—1. If lamp chimneys are used, tie a piece of cheese cloth over the lower end of each. Fill the five lamp chimneys about four-fifths full, respectively, with sand, loam, clay; one-half sand and half peat or leaf mold; and one-half clay and one-half peat. Where two kinds of materials are used in one chimney mix the substances well before putting them into the chimney.

2. Fill the lamp chimneys with water and note the amount of time it takes for the water to pass through each material. Record results in tabulated form.

Material	Time	Material	Time
Sand	.....	Sand and peat	.....
Loam	.....	Clay and peat	.....
Clay	.....		

3. Why does water move most rapidly through the sand?

4. Why does it move most slowly through the clay?

5. What was the effect of adding peat or leaf mold to the sand? To the clay? Can this be done by a farmer as a practical measure? How?

Exercise 3

MOISTURE AND SOIL TEMPERATURE

Object.—To show that when moisture is evaporating from a substance, its temperature is lower than that of a similar substance which is dry.

Explanation.—This is a demonstrational exercise. It is to be performed by the class as a whole. Each pupil

should assist in conducting the experiments. Each pupil should take notes, and should write up the experiment, answering all questions.

Materials.—Two thermometers, a drinking glass, two jars of soil, a piece of cheese cloth.

Procedure.—1. Take a piece of cheese cloth about four inches square. Roll this around the lower end of a thermometer so that about one inch projects up around the bulb. Tie the cloth to the thermometer.

2. Hang the thermometer over a glass of water in such a manner that the cloth reaches into the water and the bulb is a little above it.

3. Let another ordinary thermometer hang near the first one but outside of the glass.

4. In about 30 minutes read both thermometers and take the temperature of the water.

5. Why is the wet bulb thermometer colder than the air and the water?

6. Put a thermometer in a jar of wet soil and one in a jar of similar dry soil. After an hour read the thermometers. Results?

Questions

1. How would you expect the temperature of low wet soils to compare with that of dry upland soils in a field?

2. What kinds of soils are best suited for the production of early crops?

3. Would clay and sandy upland soils, similarly located, have the same temperature?

Exercise 4

INJURIOUS EFFECTS OF TOO MUCH FERTILIZER

Object.—To see what will happen when too much commercial fertilizer is added to growing plants.

Explanation.—This exercise is not to be performed individually, but by the class as a whole. Each member of the class should write up the experiment and answer the questions.

Materials.—Three large flower pots, or large tin cans with six or eight small holes punched in the bottoms and around the sides near the bottoms. Loam soil, oats.

Procedure.—1. Thoroughly mix enough soil to fill the three flower pots or tin cans. Have the soil moist. Fill the three pots or cans with this soil to within one inch of the tops.

2. Plant eight or ten grains of oats in each of the three pots or cans. Water and set aside in a warm place. Keep the soil moist.

3. When the oats are about three inches high, add merely a pinch of some complete commercial fertilizer to one pot at each watering. To the second add a tablespoonful of the fertilizer. Add nothing to the third.

4. After two or three weeks note and describe the results as illustrated by the growth in each pot.

5. What was the effect of adding too much fertilizer? How do you account for this? See Exercise 6, January.

Questions

1. If 1,000 lbs. of a commercial fertilizer were added to an acre of soil seven inches deep, the estimate weight of

which is two million lbs., how much fertilizer at the same rate would need to be added to the soil in the flower pot?

2. Are commercial fertilizers used in the community? What kinds?

3. Where are commercial fertilizers extensively used? Why?

4. Are all soils benefited by the same kind of commercial fertilizers?

Exercise 5

ACTION OF ACIDS ON LIMESTONE

Object.—To study the action of acids such as vinegar or lemon juice, on limestone, marble, and old plaster.

Materials.—Acid, vinegar, or lemon; limestone, marble, or old plaster; and drinking glasses.

Procedure.—1. Put a piece of limestone, marble, or old plaster in a glass or a piece of each in three different glasses, if you have them, and add a little acid to each. Try the same, adding instead of the acid, vinegar or lemon.

2. Does the solution bubble? The gas given off is carbon dioxide and this shows that the material was a carbonate.

3. Repeat, using tablespoonfuls of different samples of soil, instead of the limestone marble or plaster. Results? When a soil gives off bubbles, on the addition of an acid, it is a sign that it is not sour, because the bubbling shows the presence of a carbonate and a carbonate will neutralize or destroy any acid in the soil.

4. Try the test at home with some of the soil from your farm.

Questions

1. Why do farmers add ground limestone to their soils?
2. Do the farmers in your community lime their soils?
3. What is considered a good application of ground limestone per acre?

Exercise 6

STUDY OF A MOLD

Object.—To become acquainted with the different parts of a mold and to see how molds produce spores.

Explanation.—This exercise should be worked at home by each member of the class. If the school has a microscope, one or two pupils should bring the mold to school for microscopic study.

Molds and mold-like plants, such as the blight, mildew, smut, and rust are fungi. The plant bodies of these fungi consist usually of many thread-like, branching cells. These cells spread out over and down into the substances upon which they grow. In the smuts and rusts the cells are entirely within the plants upon which the fungi grow. These fungous plants produce millions of very small, powder-like spores, easily carried by the wind. Each spore is capable of developing into a plant like the one which produced it, wherever the conditions are favorable. This group of fungous plants do many millions of dollars worth of damage each year in destroying food and crops.

Materials.—A drinking glass, a saucer, blotting paper, bread, and bread crumbs.

Procedure.—1. Cut two or three thicknesses of blot-

ting paper to fit the bottom of the saucer. Moisten the paper and put it in the bottom of the saucer.

2. From some bread, three or four days old, cut a piece about two inches square and two inches high. Moisten this with warm water and place it on the blotting paper in the saucer.

3. Sprinkle a few fine bread crumbs, taken from the bread box, over the piece of bread in the saucer, and cover the piece of bread with a glass tumbler.

4. Set the saucer in a warm place and examine it from day to day. When the blotting paper looks dry add a little water to it to keep it moist.

5. After a week or so you will notice a growth of very slender white threads forming on the bread. This is the growing mold and the mass corresponds to the root, stem, and leaves of higher plants.

6. A few days later little round black balls should be seen on the outer ends of some of the thread-like structures. These black balls are the spore cases and contain many little spores. In time the spore cases will become so numerous as to give the mold a black color.

7. If the school has a microscope, mount some of the spore cases on a glass slide and examine them. Describe what you see. Make a few drawings.

Exercise 7

STARCH IN SEEDS

Object.—To test seeds for starch.

Materials.—Alcohol lamp, iodine solution, various seeds, test tubes.

Procedure.—1. Cut each of four or five kernels of corn into two or three pieces. Place these in a test tube containing a little water.

2. Heat the contents of the test tube for a few minutes; then slowly add a few drops of iodine solution.

3. If enough iodine solution is added, the liquid in the tube will turn blue. The blue color obtained by means of the iodine solution is a test for starch.

4. Test other seeds and substances for starch in a similar manner.

Questions

1. What other foodstuffs are found in seeds? How could you make a test for these? (See Chapter 13, "An Introduction to Agriculture," or consult a physiology text book.)

2. What seeds are commonly used to make starch?

3. What seeds contain much oil? Protein? See Table 2, Appendix, in "An Introduction to Agriculture," or Henry and Morrison's "Feeds and Feeding."

To the Teacher.—For 5 cents any druggist will sell you a small bottle of a solution of iodine to use in this exercise.

Exercise 8

STUDY OF A SEED CATALOG

Object.—To get familiar with the names of the good varieties of the common vegetables.

Materials.—Vegetable seed catalogs.

Procedure.—1. On the extreme left hand side of a sheet of your note book paper, write in a vertical column the names of all the kinds of vegetables grown in the home garden last year. If necessary, get your parents to help you complete the list.

2. Add to the list names of other common vegetables that may be planted in your garden.

3. Study a seed catalog and determine the names of one or two good varieties of each of the vegetables you have on your list. Write the names of these varieties to the right and on the same lines with the names of the vegetables. If there are early and late varieties, list them as suggested.

1. Cabbage, Early Jersey Wakefield; Flat Dutch, late.
2. Peas, Nott's Excelsior, early; Improved Stratagem, main crop.

4. Take the list and the catalog home. Discuss the list with your parents. Make changes if suggested.

5. Keep the list for use in Exercise 2, March.

To the Teacher.—Take one vegetable at a time and let the pupils look up in the seed catalogs the descriptions of the different varieties. The class should then decide which varieties are best adapted to the soil and the climate of the community.

Send to your nearest seed merchants for enough seed catalogs to supply the class, or, better still, let each member of the class send for one.

These firms issue good catalogs: Northrup and King, Minneapolis, Minn.; Vaughan's Seed Store, Chicago, Ill.; W. Atlee Burpee & Co., Philadelphia, Pa.; Peter Henderson & Co., New York City, N. Y.

Exercise 9

ORIGIN OF BREEDS OF CATTLE

Object.—To draw a map to show where the different breeds of cattle originated.

Materials.—Geography.

Procedure.—1. From your geography, copy a small map of northwestern Europe. This map should show Switzerland, Holland, Channel Islands, and Great Britain.

2. On this map, shade those places, or portions of places, where the following breeds of cattle originated:

Dairy Breeds	
Holstein	Ayrshire
Jersey	Dutch Belted
Guernsey	Brown Swiss
Meat Breeds	
Shorthorns	Galloway
Herefords	Aberdeen-Angus

3. Briefly discuss the origin of each breed mentioned above.

4. A similar map showing the origin of the breeds of horses may be made.

To the Teacher.—This would be a good exercise to add to Exercise 9, November, "Making a Dairy Cattle Booklet."

References.—F. B. 612: Breeds of Beef Cattle. F. B. 893: Breeds of Dairy Cattle. "An Introduction to Agriculture," Chapter 23. Breeds of Light Horses, F. B. 952. Breeds of Draft Horses, F. B. 619.

Exercise 10

LEADING ALFALFA GROWING STATES

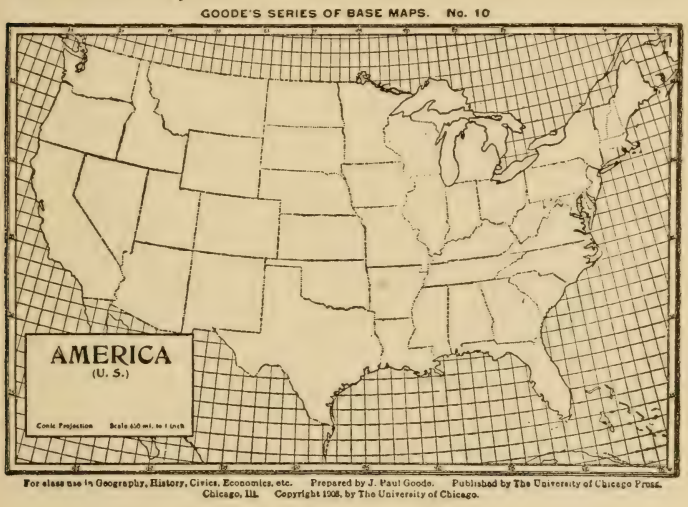
Object.—To make a map showing the states leading in the production of alfalfa.

Materials.—Outline map of the United States, Agricultural Yearbook.

Procedure.—1. Enumerate in a tabular form the ten

states leading in the production of alfalfa. Consult the latest Agricultural Yearbook.

	State	Acreage	Total Yield	Yield per Acre
1.				
2.				
3.				
4.				
Etc.				



2. On an outline map of the United States shade these states and write in each the total acreage of alfalfa.

3. Discuss the map.

4. A similar exercise may be devoted to any of the other crops grown in the community.

Questions

1. Why is more alfalfa grown in western than in eastern states?

2. Why is alfalfa an important crop to grow?

Exercise 11

RAISING SEEDLINGS IN FLATS

Object.—To learn how to raise plants in shallow plant boxes or flats.

Materials.—A number of flats of shallow plant boxes 2 to 3 inches deep, measuring 12 x 18 inches. Rich garden soil, sand, and seeds, coarse and fine sieves, fine gravel, or cinders.

A FLAT WITH SEEDLINGS. WHY NOT RAISE YOUR OWN PLANTS?—*Courtesy U. S. Department of Agriculture*

Explanation.—Many greenhouse men sow all the seed for early plants in flats or shallow plant boxes. These flats are then placed on the benches in the greenhouse or in the hotbeds. Flats are easily carried about; they make the sowing and transplanting easy, are of great convenience in taking the plants to the field or to the market. Flats are also used in planting seeds in the house or cellar for early plants.

Procedure.—1. Spread a layer of fine gravel or sifted cinders ½ inch deep in the bottom of the flats to aid in draining off free water.

2. Mix good garden soil with a little coarse sand until the soil is light and crumbly. Add water to the mixture to get it moist.

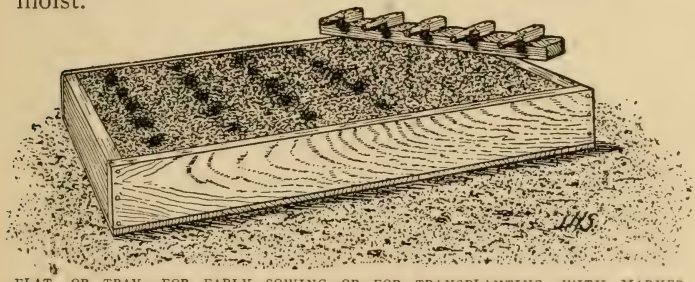
3. Run this through a ¼ inch sieve and fill the flat with the sifted soil. Slightly press the soil in the flat with a piece of 2 x 4.

4. Run some of the sifted soil through a finer sieve made of window screening and almost fill the box with the fine soil. Level this with a scraper.

5. Make little furrows ⅛ to ¼ inch deep about two inches apart. In these sow the seeds about ten to an inch.

6. Cover lightly the seeds. Press the soil and sprinkle with a fine spray, being careful not to wash out the seeds.

7. Set the flats in a warm, light place, and keep the soil moist.



FLAT, OR TRAY, FOR EARLY SOWING OR FOR TRANSPLANTING, WITH MARKER FOR MAKING HOLES IN THE SOIL INTO WHICH THE SEEDLINGS ARE SET.—*Courtesy U. S. Department of Agriculture*

8. When the plants have their second leaves or about four weeks after the seeds were planted, thin them to stand about two inches each way.

9. Plant those plants you have removed in other flats. (Read Exercise 4 in May.)

References.—F. B. 818: The Small Vegetable Garden. Any vegetable garden book.

Exercise 12

ORCHARD SURVEY

Object.—To make an orchard survey of the school district.

Procedure.—1. The following is a suggested outline for an orchard survey of the school district.

Orchard Survey

School District No..... Town of..... Co.....
Date.....

	Farmer	Number of apple trees	Yield in bushels last year	Number of cherry trees	Yield in bushels last year	Spraying
1.						
2.						
3.						
4.						
Etc.						

2. To the list given above may be added other fruit trees if they are common to the community.

3. For general directions in gathering the information, see Exercise 11, September.

4. In column headed spraying, state whether or not orchard was sprayed.

Project 1

RAISING FLOWER SEEDLINGS

Object.—To raise flower seedlings for home use.

Explanation.—Any boy or girl who loves flowers can

grow many of them by starting the plants indoors late in February, or early in March.

Preparation.—1. Make a study of seed boxes or flats. Try to see some.

2. Make a study of the best soil for seed boxes and of how this is mixed.

3. What common flowers should be started indoors at this time of the year?

4. Where are good places in which to keep the seed boxes? How often should they be watered?

5. When should the plants be transplanted?

6. Read Exercise 11, February, and Exercise 4, May.

Operation.—1. Order the seeds.

2. Make the seed boxes.

3. Prepare the soil and fill the flats.

4. Sow the seeds, water the soil.

5. Take proper care of the plants. Transplant to proper intervals.

6. Sell surplus plants.

7. Keep accurate account of all your time and expenses and determine the cost of raising the seedlings.

References.—"An Introduction to Agriculture," Chapter 17. Any vegetable garden book. F. B. 255: The Home Vegetable Garden. F. B. 818: The Small Vegetable Garden.

Project 2

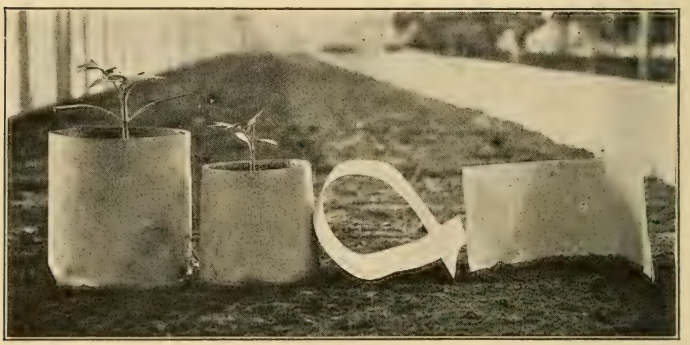
RAISING VEGETABLE SEEDLINGS

Object.—To raise vegetable seedlings for the home garden.

Explanation.—Any boy or girl in the upper grades should be able to raise tomato, cabbage, cauliflower,

head lettuce and other seedlings for the home garden. This may be done in seed boxes or in hot beds, or better still, by a combination of both these methods.

Preparation.—1-5. Review articles 1-5 in previous project.



SMALL SEEDLINGS TRANSPLANTED INTO PAPER BANDS.—*Courtesy Indiana Agricultural Experiment Station*

6. Make a study of hot beds and cold frames. Decide which you want to use.

Operation.—1-6. Review the similar articles on the previous project.

References.—See previous exercise.

THINGS TO OBSERVE IN FEBRUARY

The scales covering buds
The buds of some common trees
How frost helps in soil formation
Common blemishes on horses
The birds that stay with us all winter
How some animals spend the winter.

MARCH

Exercise 1

TESTING SEED CORN

Object.—To learn how to test seed corn.

Explanation.—Why seed corn should be tested.

Testing enables one to discard weak and dead ears.
Weak and dead seed means a poor stand.
A poor stand means a poor crop.
To plant a dead ear means 500 to 700 missing stalks.
It is only good business to know what we are planting.
Like tends to produce like.
If we want good corn we must plant good corn.
We cannot guess how corn will grow.
Testing shows how the corn will grow.

Materials.—Seed corn testers, muslin, sawdust, corn.

A. *Sawdust Box Method*

Procedure.—1. From any old lumber make a box 4 inches deep and 19 inches wide and 24 inches long, inside measurements. The bottom boards should be ⅛ of an inch apart to permit good drainage. This box will be large enough to test 48 ears of corn. A box 30 x 30 inches will test 100 ears.

2. Half fill the box with clean sawdust which has been thoroughly soaked in hot water. Pack this firmly and level the surface.

TACKING THE MARKED CLOTH FIRMLY OVER THE SAWDUST TO THE CORNERS OF THE TESTER.—*Courtesy International Harvester Co.*

3. Take a piece of firm muslin. Mark off on it, with a soft pencil, 48 two and one-half inch squares and leave a two inch margin on all four sides. Number the squares 1 to 48. Wet this muslin and tack it at the four corners of the box so as to hold the cloth tightly in place, so that the corn will not be disturbed.

4. Number 48 ears of corn, or place them so that you can keep track of the number of each ear. Take six kernels from ear one, two from near the top, two from the center, and two from near the bottom, and place these in square 1. Have the germ sides up and all the tips pointing in one direction. Continue this with all 48 ears.

COVERING THE KERNELS WITH THE SECOND CLOTH. IT, TOO, SHOULD BE TACKED TO THE TESTER. — *Courtesy International Harvester Co.*

5. Cover the kernels with another piece of moistened

muslin and tack this in the four corners.

6. Over this place still another piece of muslin large enough to overlap by 10 inches on all four sides of the box. Pour into this cloth enough moistened sawdust to fill the box. Pack the sawdust and turn in the ends of the cloth.

SPREADING THE LARGE CLOTH OVER THE TESTER TO HOLD THE TOP LAYER OF SAWDUST.—*Courtesy International Harvester Co.*

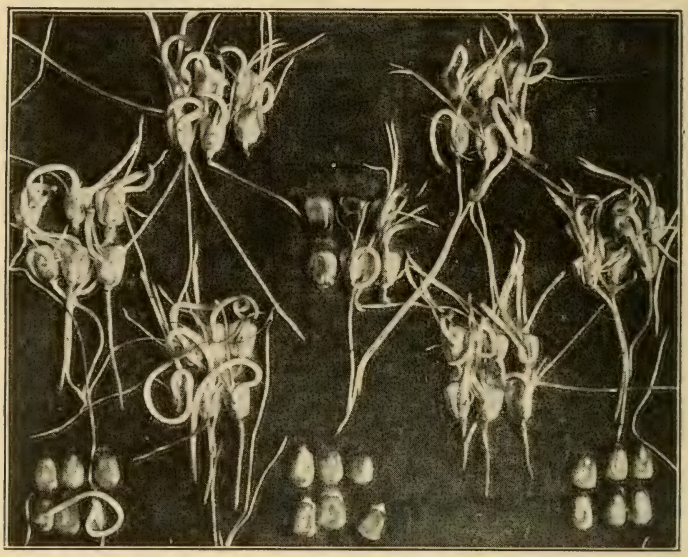
7. Keep the box in a warm room and raise it about an inch at one end so that the tip of the kernels point downward.

8. After seven or eight days, remove the cloth with the sawdust, then carefully remove the second cloth, and record the results of the test.

FOLDING THE PROJECTIONS OF THE LARGE CLOTH OVER THE TOP LAYER OF SAWDUST. —*Courtesy International Harvester Co.*

9. Write numbers from 1 to 48 on a sheet of paper, and after each number, write figures such as 6-0-0, 0-6-0, or 0-0-6, the first figure indicating the number of strong kernels, the second, the number of the weak ones, and the third, the

dead ones. Only the ears testing 6-0-0 should be used for seed.



WHAT A PORTION OF THE TESTER LOOKS LIKE AFTER THE CORN IS UNCOVERED. DID IT, IN THIS CASE, PAY TO TEST THE CORN?—*Courtesy Wisconsin Agricultural Experiment Station*

Questions

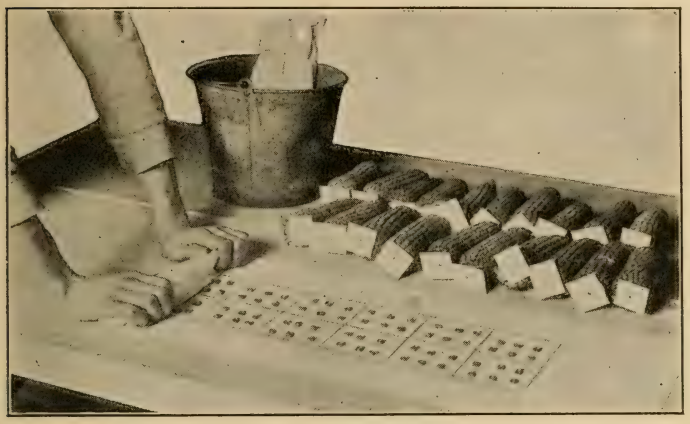
1. What is gained by testing shelled seed corn?
2. Which kind of seed corn is the better to buy, ear corn or shelled corn?
3. Why should the cloths and sawdust be scalded the second time the tester is used?

B. *The Rag Doll Method*

Procedure.—1. Procure a piece of well washed, tightly woven muslin about 10 inches wide and 28 inches long.

In the center of this, mark off ten 2½ inch squares, five on a side. This will leave a 2½ inch margin at each side, and a 7¾-inch margin at each end. Number the squares from 1 to 10.

2. Arrange 10 ears of corn so that you can keep track of the numbers. Place 6 kernels from ear 1 in square 1,



ROLLING UP A RAG DOLL TESTER.—*Courtesy University of Wisconsin*

tips pointing to one side and germs sides up. Continue this for the ten ears.

3. Place two handfuls of soaked sawdust on the lower end of the cloth and roll up the cloth loosely.

4. Tie a string around each end and around the center. Make an arrow to indicate the direction the tips are pointing.

5. Put the rag doll in water over night. The next morning, pour off the water and cut the strings. Put the doll in a bread pan. Raise one end an inch so that the tips

point downward. Keep the pan in a warm room and keep the doll moist by occasional watering. Keep the pan partly covered.

6. After seven or eight days, carefully unroll the doll and record the results as suggested in the sawdust box method.

7. If you wish to test very many ears of corn by this method, make the cloth 13 inches longer, and then you can test 20 ears at a time.

8. A bread pan will easily accommodate three rag dolls. If a pail is used in which to keep the dolls instead of a bread pan, you can accommodate many more.

Questions

1. Which method of testing corn do you prefer? Why?
2. With which method must you be most particular? Why?

To the Teacher.—Demonstrate these exercises in the school room, getting the pupils in the class to assist you. Encourage the class to test seed corn at home. F. B. 948, The Rag Doll Tester gives good suggestions.

Exercise 2

PLANNING THE HOME GARDEN

Object.—To plan the home garden so that the work may be systematized, no space wasted, and all the different desired varieties of vegetables given the proper amount of space.

Materials.—Ruler, tape, or rod stick.

Procedure.—1. Determine the exact size of the home garden by careful measuring.

2. Consult your parents and obtain both a list of the various vegetables to be grown in the garden, and also an idea of the amount of space in rows, to be devoted to each kind of vegetable. Exercise 8, February.

3. Look up the cultural directions given for each variety in a seed catalog and in Table 11, Appendix. Find out how far apart the rows should be and how far apart the seeds are to be planted in the row, according to the method of cultivation you are going to use.

4. Make an outline of the garden, drawn accurately to some scale, such as making ¼ or ⅛ inch on paper equal to one foot of the garden.

5. Indicate, by light lines on the garden map, the rows of vegetables. Have the proper distances between the rows. Place on the plan the names of the vegetables to be grown and give to each its proper proportion of space.

6. Show the plan to your parents, discuss it with them, and make suggested changes. If necessary, make a revised plan.

7. Determine the number of linear feet for each kind of vegetable, and the quantity of seed required.

8. Determine, with your parents, having the notes from Exercise 8, February, with you, the variety and amount of each kind of seed to order. Order the seeds early.

9. Keep the plan to use in staking out and planting the garden.

SUGGESTIVE PLAN OF A GARDEN

1′	Corn or Potatoes
1¾′	Spinach or Onion Sets
1¾′	Corn or Potatoes
2½′	Beans follow with Turnips
2′	Beans follow with Lettuce
2′	Spinach or Onion Sets
2′	Spinach follow with Tomatoes
2′	Early Beets and Carrots
2′	Swiss Chard or Parsnip
2′	Peas follow with Beans
2½′	Peas follow with Beans
2′	Radish and Lettuce follow with Beets
1′	

Suggestive Garden Plan, Scale ¼″ = 1′.
Garden is 24½ ft. wide. Rows may be as long as desired.

Exercise 3

HOTBEDS

Object.—To make a hotbed.

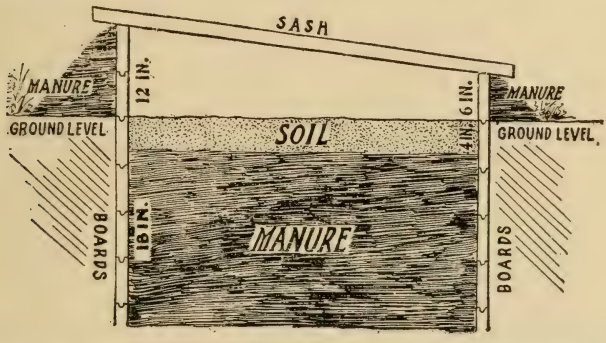
Materials.—Lumber, nails, tools, fresh horse manure, soil.

Explanation.—This is a splendid exercise for the boys

of the agriculture class; they should build a hotbed either on the school grounds or on the home farm of one of the boys living near the school.

Procedure.—1. Study the sectional view of a hotbed shown below.

2. Plan to locate the hotbed on the south side of some building. Make it to fit the sash you are going to use. A storm window will answer well.



HOTBED SHOWING PLAN OF CONSTRUCTION.—*Courtesy Pennsylvania State Board of Agriculture*

3. Make the frame 28 inches high in the front, 34 inches in the back, and a few inches shorter and narrower than the sash. Fit the sash to the frame before you nail it together permanently.

4. Make an excavation about two feet deep and a few inches longer and wider than the frame; then set the frame in it as shown in sketch.

5. Fill the hotbed with fresh horse manure and tramp this down firmly to make a layer 18 inches deep. Level the surface and place about 4 inches of a rich garden loam upon the manure.

6. Bank the outer sides with manure.

7. Cover with the sash and place a thermometer in the hotbed, inserting it a few inches in the soil. After the heat has reached its maximum and subsided to about 80°, plant the seeds in rows about 4 inches apart.

8. Water often enough to keep the soil moist but only in the morning. Regulate the temperature by raising and lowering the sash. On clear warm days remove the sash entirely.

QUESTIONS

1. Why use only horse manure?
2. What is the danger of keeping the soil too moist?
3. How can you protect the hotbed during cold weather?

Exercise 4

A COLD FRAME

Object.—To make a cold frame.

Materials.—Lumber, nails, tools, sash or muslin.

Explanation.—The cold frame is used to harden plants grown indoors, and to raise plants after the soil and weather have become mild. No manure is used in a cold frame.

Procedure.—1. Decide how large the frame is to be. Make a frame 8 inches high in the front, and 14 or 16 inches high in the rear, and just a little shorter and narrower than the sash or muslin to be used.

2. Place the frame in a sheltered position facing the south. Spade the soil within it, and, if necessary, add some good rich soil.

3. Bank the outer sides with manure or soil.

4. Plant seeds in the soil as directed in previous exercise.

5. Cover the frame with muslin during cold nights and chilly days.

To the Teacher.—As a demonstration get several of the boys in the class to build a cold frame, to be used either on the school grounds, or at the home of some member of the class.

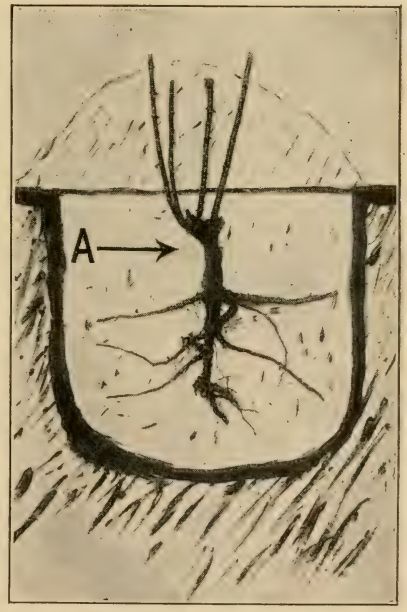
Exercise 5

TREE PLANTING

Object.—To learn how to transplant properly a tree.

Materials.—Spade, pruning shears, a tree.

Explanation. — Each year the teacher and the class should plant a tree on or near the school grounds. This exercise should be carried out by the class as a whole.



A CUT SHOWING HOW LARGE TO MAKE THE HOLE AND HOW TO SPREAD THE ROOTS WHEN PLANTING TREES AND SHRUBS.—*Courtesy Neosho Nurseries Co., Neosho, Missouri.*

Procedure. — 1. Carefully dig up a small tree from a wood lot, being careful to disturb the roots as little as possible.

2. Dig a hole large enough to take all the roots in their natural position and deep

enough to allow the tree to be planted a few inches deeper than it has been. If soil appears to be dry pour a bucket of water in the hole.

3. Cut off any bruised or broken roots, and the rough ends of the large roots, with smooth cuts.

4. Place the tree in the hole and press the dirt very firmly about the roots so that the roots come into close contact with the soil. Fill the hole and leave the top few inches of soil loose.

5. Prune back the top of the tree fully one-half, and cut out all unnecessary branches to give the transplanted tree a good shape.

Questions

1. Why cut off about ½ of the top of the tree after transplanting?
2. When is the best time to transplant trees?
3. Why leave the top few inches of soil unpacked?

Exercise 6

PREPARING THE GARDEN

Object.—To prepare the garden soil.

Materials.—Spade or garden fork, rake, manure.

Explanation.—Each spring the pupils should assist their teacher in all the different operations of preparing a garden. This may be done on or near the school grounds or at the home of one of the pupils who lives near by. In writing up the exercise each member of the class should follow the outline given below.

Procedure.—1. See that all rubbish which will not readily decay is removed from the garden spot.

2. Apply some well rotted manure, if available, to the garden. Usually 20 loads or tons per acre is considered a good application. According to this scale, how many loads or tons would be a good application of manure for the intended garden?

3. If the garden is large enough and conveniently located, it should be plowed and harrowed. If it must

AFTER THE MANURE IS EVENLY SPREAD, SPADE AS DEEPLY AS POSSIBLE WITHOUT BRINGING ANY RAW SUBSOIL TO THE SURFACE.—*Courtesy W. Atlee Burpee & Co., Philadelphia, Pa.*

be spaded, spade 8 to 10 inches deep. As soon as a spade full of earth is turned over it should be broken up by blows with the implement.

4. After a strip three or four feet wide across the garden has been thus broken, fine and smooth the surface with a garden rake.

5. Take a handful of the soil from each of several places to be tested for acidity. (See following exercises.)

6. If commercial fertilizer is to be used, apply half the

proper amount now to the prepared soil, and rake it in. Apply the other half, between the rows, after the plants are started. Fifteen hundred pounds of an average complete fertilizer is a good application when no manure is used and 300 to 500 lbs. when manure is used. According to this scale how much could be safely applied to the garden which has been prepared?

THE HANDFUL OF FERTILIZER BEING DROPPED INTO EACH HOLE WILL BE WELL MIXED WITH THE SOIL BEFORE THE PLANT IS SET.—*Courtesy W. Atlee Burpee Co.*

7. Wood ashes make a good fertilizer and 1000 lbs. of unleached wood ashes per acre is a good application. According to this scale how much could safely be applied to this garden?

8. If the soil is sour, this is a good time to sweeten it.

9. After every rain, or whenever many weeds begin to show, cultivate or rake the garden. This process also conserves moisture as shown in Exercise 1, April.

Questions

1. Which is the best time to plow or spade a garden, the fall or spring? Why?
2. Why add lime or fertilizer after plowing or spading, instead of before?
3. Why add manure before plowing?
4. When is the soil in a good condition to plow or spade?

Exercise 7

TESTING SOILS FOR ACIDITY

Object.—To learn how soils may be tested for acidity.

Materials.—Blue and red litmus paper, vinegar, lime, sample of garden soil, piece of glass about 4 inches square, several drinking glasses.

Procedure.—1. Review Exercise 5, February. To half a glass of water add a tablespoonful of vinegar. Thrust into the liquid a piece of blue litmus paper and note the change of color. (Litmus paper may be purchased at drug stores.)

2. Add a tablespoonful of lime to another glass of water and into this liquid place a piece of red litmus paper and note the change of color.

3. Acids turn blue litmus paper red and alkalies turn red litmus paper blue.

4. With as little handling as possible gather a little soil from several places in the garden and put this into a clean tin can.

5. Place a piece of moistened blue litmus paper on a piece of glass. Moisten in a saucer some of the soil you have gathered. Get it so wet that a little mass just stays in a pile. With a spoon place this moistened

soil over the blue litmus on the glass, and let it stay there for 10 or 15 minutes.

6. Look up through the glass and note the color of the litmus paper. If the soil is sour the paper will have turned red.

7. Laboratory supply companies, *see* Appendix, sell the Truog Soil Testing Apparatus. With it you can tell just how sour a soil is.

8. If the soil is sour make a few other tests to confirm your first results. Add a little vinegar to some of the soil as directed in Exercise 5, February. Results?

9. One thousand pounds of slaked lime, or one to two tons of finely crushed limestone, are applied per acre to sweeten a soil. According to this scale, how much does your garden need?

10. Test at home with red and blue litmus paper:—soap, milk, Dutch cleanser, coal ashes, wood ashes, orange juice, and other substances.

Questions

1. Why do soils get sour?
2. What kinds of soils get sour?
3. Does it pay to sweeten soils? Ask your father.

Exercise 8

HARD WOOD CUTTINGS

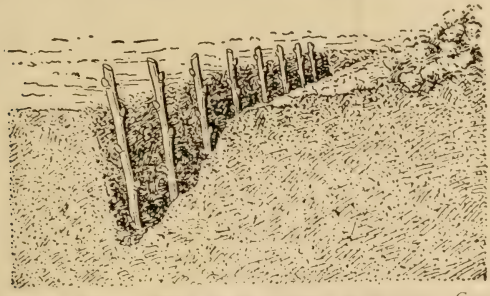
Object.—To learn how to propagate plants like grapes, currants, gooseberries, and shrubs, such as the privet, by means of cuttings.

Materials.—Access to plants to be propagated, knife.

Procedure.—1. From last year's growth of any of the

plants mentioned, cut off pieces having about three buds. Make each cut just below the third bud.

2. Plant these indoors, or directly outdoors, in a light



CUTTINGS SET IN TRENCH, READY TO BE COVERED WITH SOIL.—*Courtesy U. S. Department of Agriculture*

soil, so that only one bud appears just above the ground. The buried buds will develop roots and make new plants.

3. Later in the season when the new plants have developed, they may be transplanted whenever desired.

Questions

1. Why cut off the pieces just below a bud?
2. Should or should not the portion of the branch from which the cutting was made be cut back to a bud? Reasons? *See* Exercise 3, October.
3. Why should all cuts be made as smooth as possible?

Exercise 9

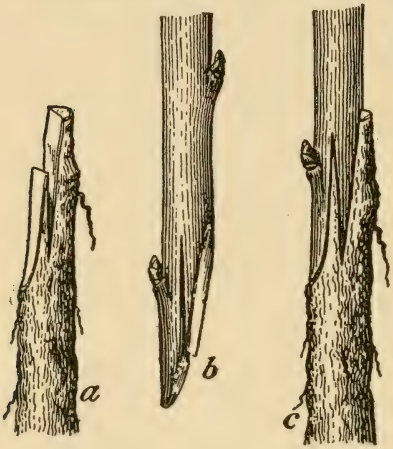
ROOT GRAFTING

Object.—To learn how to make a root graft.

Materials.—Willow twigs and roots, sharp knife, string.

Explanation.—The principle of grafting is simply the

bringing together of two portions of two different individual plants of the same species, so that the cambium layers, or growing portions, will be brought into contact with each other. That portion of the plant which contains the root is known as the *stock,* and the upper part which is grafted on to this, is known as the *scion.*



ROOT OR WHIP GRAFTING. A, STOCK; B, SCION; C, STOCK AND SCION UNITED.—*Courtesy U. S. Department of Agriculture.*

Procedure.—1. Dig up a young willow tree and use it to learn how to graft.

2. Cut off from the branches a number of scions, 6 or 8 inches long.

3. Cut from the roots, stocks or pieces three to four inches long, and of the same thickness as the scions.

4. Cut the lower end of the scion and the upper end of the stock as is shown in the illustration.

5. Fit these together and fasten the two with string.

6. Practice this joining several times and, as an experiment, plant some of the joined scions and stocks to see if they will grow.

7. Apples are propagated in the manner described. The scions are taken from trees having the desired fruit and these are grafted to the roots of apple seedlings.

QUESTIONS

1. Why are apple trees propagated by grafting?
2. Why is it necessary to have the cambium layer of the scion come in contact with the cambium layer of the stock?

Exercise 10

GARDEN RECORDS AND ACCOUNTS

Object.—To learn how to make and use garden records and accounts.

Explanation.—Garden records afford excellent opportunities for training in elementary bookkeeping. The garden record should show all the time devoted to the work, all expenditures, all receipts, and monthly and final summaries.

Procedure.—1. Procure a composition book; one measuring 7 x 8 inches will do. Use the first page for the index.

2. Use the second page for the labor records of the first month and the third page for expenses and receipts for the same month, as here suggested.

Labor Records. Month.....

Date	Hours	Kind of work.
1	1	Clean up the garden.
2	2	Hauling and spreading manure.
3	etc.	
4		
etc.		

Insert all hired labor under expense. Put down what you paid for this labor if you had to pay for it.

Month.....

Date	*Expenses. Dr.* Item	Amount
1	Seeds—(specify kinds)	$.25
2	Team and man—hauling manure	.80
Etc.	2 hours @ 40¢	

Enter all expenses. If you did not pay in cash for any item, enter its worth. If you buy any tools especially for your own use, enter ⅓ of their value; this assumes they will last 3 years.

Date	*Receipts. Cr.* Vegetables or plants sold	Vegetables used at home	Amount
20	3 doz. tomato plants	....	$.30
30	....	2 bunches onions	.10

Estimate value of all vegetables used, at price they would bring if sold.

3. For each remaining month, you will need two pages of your note book, preferably two that open together.

4. Somewhere near the back of the book have a page for the monthly summary sheet as suggested:—

Monthly Summary

Month	Hours of labor	Total value	Expenses	Cash receipts	Other receipts
March	10	$1.00	$2.50	$.50	$.75
April					
May					
Etc.					

5. Under "Hours of Labor" insert totals from your monthly labor records. Charge 10 to 15 cents per hour, according to what you are worth. Insert the value of this labor under "Total Value." Under "Expenses" insert monthly totals. This should include cost of seed, special garden equipment, hired or donated help, etc. Under "Other Receipts," enter value of vegetables used at home. Under "Cash Receipts" enter your cash sales.

6. Close the year's work with a summary sheet as suggested.

Yearly Summary

	Dr.	Cr.
Personal labor.....	$.....	
Expenses.....	.....	
Cash receipts.....		$.....
Other receipts.....		.....
Totals.....	$.....	$.....
Profits.....	.....	.....
Balance.....	.....	.....

To the Teacher.—In many states rural teachers are supposed to teach some form of cash accounts in the upper grades. Why not start this exercise with the seventh grade pupils? Let them carry it through the season and bring it to a close in the fall.

Exercise 11

HORSE SURVEY

Object.—To make a horse survey of the school district.

Procedure.—1. In making this survey, or census report of the number and kinds of horses in the school district, follow all the directions given in Exercise 11, September.

2. In this survey use the following, suggested, tabulated form.

HORSE SURVEY.

School Dist. No..... Town of..... Co.....

Date.....

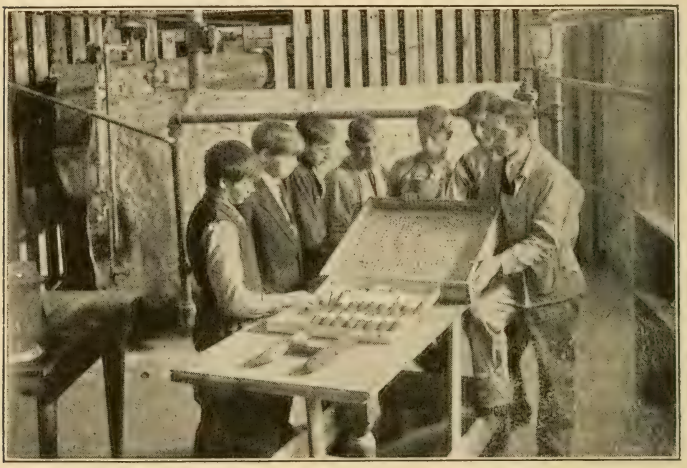
Name of Farmer	Number horses over 3 yrs. of age	Number of colts under 3 yrs. of age	Breed	Grades or pure breds
1.				
2.				
3.				
4.				
Etc.				

3. If there are any mules in the district include another column and head it "Number of Mules."

Project 1

TESTING SEED CORN

Object.—To make a germination test of the corn to be used at home for seed.



LET THE BOYS AND GIRLS TEST THE SEED CORN.—*Courtesy Wisconsin Agricultural Experiment Station*

Preparation.—1. Study different practical methods of testing seed corn.

2. Read Exercise 1, March.

3. Decide upon the method to be used, and prepare the testers.

4. Be sure that you have a proper place in which to keep the testers.

5. If possible, try to see how some farmer in the neighborhood tests corn.

6. Learn to know the difference between weak and strong germinating powers.

Procedure.—1. Arrange the corn so that you can keep track of the number of each ear, or number the ears.

2. Prepare the tester. Number the squares.

3. Fill the tester, all germs up and tips all pointing in one direction.

4. Properly cover the corn and raise one side of the tester an inch so that the tips point downward.

5. After 7 or 8 days note the results and keep for seed only those ears testing 6 strong.

6. Figure the percentage of strong, of weak, and of dead ears.

7. Keep a record of your time, and figure the cost of testing 100 ears of corn.

Reference.—F. B. 948: The Rag Doll Tester. Seed Corn. Do you Know That It Will Grow? Ext. Dept. International Harvester Co., Harvester Bldg., Chicago, Ill., 3 cents.

Project 2

MANAGEMENT OF THE HOME GARDEN

Object.—To take complete charge of the management of the home garden and to keep accurate garden accounts.

Preparation.—1. Secure permission from your parents to take charge of the garden this year, and solicit their coöperation.

2. Make a study of garden records and accounts. Read Exercise 10, March.

3. Study how to make a garden plan, how to get the soil rich in plant food, and into an ideal tilth.

4. Become familiar with the names of good varieties of vegetables. Read Exercise 8, February.

Procedure.—1. Procure a composition book. One about 7 x 8 inches, the size commonly used in school, will answer. Use this for your record book. Devote the first page to a table of contents, and the following pages to the records as outlined in Exercise 10, March.

A CONFERENCE BETWEEN PUPIL AND TEACHER IN THE GIRLS' GARDEN. SUCH CONFERENCES BRING GOOD RESULTS.—*Courtesy Iowa State Teachers' College*

2. Make the garden plan. See Exercise 2, March. Talk the planning over with your parents. Ask them what to plant and the amount of the space to give to each variety of vegetable. Consider rotation of crops in the plan.

3. Keep accurate record of your time, of all expenses, and all receipts.

4. Prepare the garden. See Exercise 6, March.

5. Stake out the garden, and at proper time begin to plant.

6. Seek your parents' advice from the beginning to the end of the project.

7. Make an effort to sell all surplus vegetables.

8. Be sure to make out your monthly summary at the close of each month, and your final yearly summary.

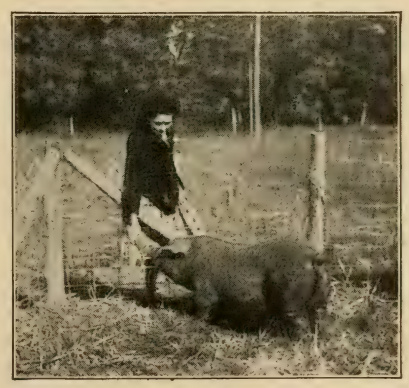
9. Use the last four or five pages of your record book for a story of your project. Give a little history of it, telling the interesting things about the work and something about the final financial statement.

Project 3

PIG PROJECT

Object.—To raise one or more pigs and to keep very accurate records of the cost of raising one or more pigs.

Explanation.—Pig projects are popular because of the great number of boys' and girls' pig clubs. If a number of boys and girls in the school start this project they should form a pig club and get into communication with the State Leader of Boys' and Girls' Club work. This project is best started with weaned pigs from 8 to 12 weeks old. These must be purchased and the records must show the purchase price. The project should be started sometime in May and be con-



SOME OF OUR MOST SUCCESSFUL PIG PROJECT WORKERS ARE GIRLS.—*Courtesy Iowa State Teachers' College*

tinued from 4 to 8 months. Each pupil taking up this project must feed his pigs, care for them, and keep his own accurate records.

Preparation.—1. Get permission from your father to start a pig project and solicit his advice on all important matters.

ALL THE MEMBERS OF A BOYS' PIG CLUB. THESE BOYS HAVE LEARNED HOW TO RAISE PIGS.—*Courtesy U. S. Department of Agriculture*

2. Carefully consider and study the following questions:—a. How many pigs shall I attempt to raise? b. Shall I get grades or pure breds? What breed? c. Where and how am I going to get the pigs? d. Where can I keep and house them? e. What should I feed them and where am I going to get the feed? f. Should I grow special forage crops? What kind and

how large an area shall I need? g. How shall I be able to weigh the pigs? What records should I keep?

Procedure.—1. Get a composition book, similar to those you use in school, and use it for your record book.

2. Use page 1 for the table of contents.

3. Use page 2 for the following, devoting one line to each item:—a. Number of pigs in project? b. Breed? c. Grade or pure breds? d. Date project started? e. Age of pigs at start? f. Value at start? g. Weight at start?

4. Use page 3 for recording at close of each month the weights of the pigs, if the pigs can be weighed each month. Use suggested form. If no scales are at hand merely record initial and final weights.

Record of Weights by Months

Month	Weight in Pounds	Gain in Pounds
First (insert dates)		
Second		
Etc.		

5. Use sheets 4 and 5 for one month's labor and feed records. Record the hours spent each day on the project. If, while at school, the pigs were fed for you, get the time and add it to your time.

6. On page 5 record the feed purchased during the month as suggested:—

Monthly Feed Record

Date	Kind of Feed	Pounds	Cost
1.			
2.			

Weigh and make charge for skim milk if used. Make charge for foraging, at actual cost or at so much per day for pasturing. Use 2 pages for the same uses for each following month. Allow about 16 pages for these monthly records. Get totals for each month.

7. Transfer monthly totals to a summary sheet as suggested.

Month	Hours of Labor	Feed Cost	Other Expenses
1.			
2.			
Etc.			

8. Formulate the ration you are going to feed.

9. Make preparations for housing the pigs before starting the project.

10. Get the totals of the summary sheet (item 7) and fill out the following summary:

Expenses

a.	Cost of pigs at beginning of project.....	$.....
b.	Total feed cost	.....
c.	Total labor cost @ 10¢ per hour.....	.....
d.	Other expenses	.....
	Total expense.....	$.....

Receipts

a.	Final weight of ..... pigs ..... lbs.	.....
b.	Value of pigs @ ..... ¢ per pound	$.....
	Total receipts.....	$.....
	Total expenses.....	.....
	Profits.....	$.....

Other Data

a.	Weight of pigs at beginning of project.....	.....	lbs.
b.	Weight of pigs at close of project.....	.....	lbs.
c.	Gain.....	.....	lbs.
d.	Number of days fed.....	.....	
e.	Average daily gain.....	.....	
f.	Cost per pound of gain.....	.....	

11. Write a story or discussion of your project on some of the remaining pages of the record book.

F. B. 765: Breeds of Swine. F. B. 874: Swine Management. F. B. 909: Self Feeder for Hogs. F. B. 951: Hog Pastures for Southern States: Yearbook Separate, 667 Boys' Pig Club Work, 5 cents. F. B. 566: Boys' Pig Clubs. Cir. 6: Swine, Armour's Research Bureau, Stock Yards, Chicago. Dept. Bul. 646: Lessons in Pork Production for Rural Schools, 5 cents.

THINGS TO OBSERVE IN MARCH

Good plowing
Treating oats for smut
Treating potatoes for scab
Fanning mill cleaning seeds
Grafting work
Results of freezing on fall plowed land

APRIL

Exercise 1

CHECKING EVAPORATION

Object.—To see how a dust mulch acts in checking evaporation.

Materials.—Two pieces of lump sugar, teaspoonful of powdered sugar, saucer.

A DUST MULCH CHECKS EVAPORATION.—*Courtesy International Harvester Co.*

Procedure.—1. Put enough water in two saucers to make a layer of about ¼ of an inch deep, and add a few drops of ink to the water in each saucer.

2. Put a heaping pile of powdered sugar on a piece of lump sugar and carefully set this in a saucer containing the colored water.

3. In the other saucer, place an ordinary lump of sugar.

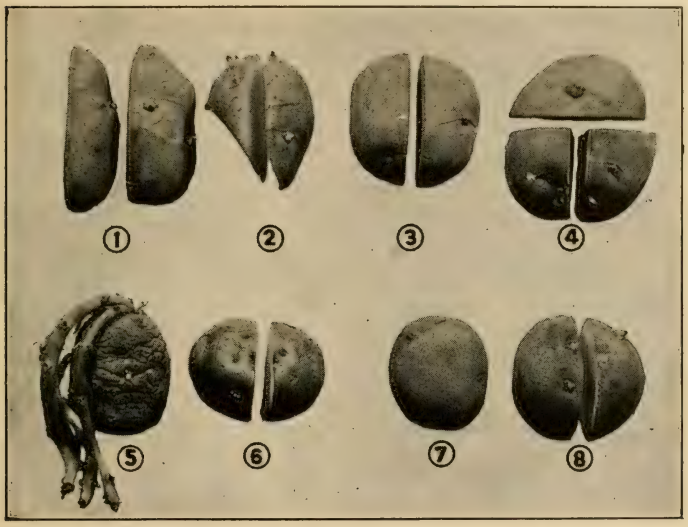
4. How high does the water rise in each lump of sugar? Why does it not rise to the top of the powdered sugar?

Questions

1. If the powdered sugar is regarded as the light mulch on a soil, explain how it checks evaporation. (See "An Introduction to Agriculture," page 44.)

2. What effect would hoeing a garden and leaving it rough and lumpy have upon evaporation?

3. How could one establish a fine dust mulch on the garden soil?



SEED CUT IN BLOCKY PIECES LIKE NUMBERS 3, 4, 6, AND 8, IS PREFERRED. POTATOES LIKE NUMBER 5 SHOULD NOT BE USED.—*Courtesy Wisconsin Agricultural Experiment Station*

Exercise 2

CUTTING SEED POTATOES

Object.—To learn how to cut seed potatoes.

Materials.—Knife, a number of potatoes.

Procedure.—1. Study the pictures and practice cutting a number of potatoes.

2. Cut them any way, provided that each piece has two eyes and a good portion of the flesh of the potato. Remember that until the roots can develop sufficiently to begin to take raw plant food from the soil, the young potato draws its food from the cutting.

3. Many potato growers dust the cut pieces in land plaster to check wilting. If land plaster is available dust a few cut pieces and expose them with undusted pieces a few days and notice the difference.

To the Teacher.—This exercise should be worked a day or two before potatoes are planted in the community, so that the cut pieces need not be wasted. Some one living near the school may be glad to have the class cut a bushel of seed for them.

Exercise 3

HATCHING CHICKS

Object.—To observe different methods of hatching chicks.

Procedure.—1. With your teacher visit some farms near the school where chicks are successfully raised both by means of hens and by means of incubators.

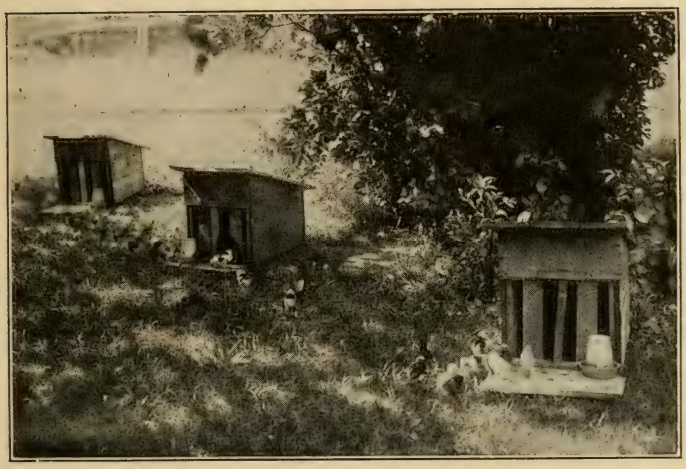
2. Where eggs are hatched by means of hens, each member of the class should observe the following:—

Location of nest, kind, size, how kept free of lice, number of eggs in nests, the breed of the hen, feed given to the hen, source and kind of eggs used, testing for infertile eggs.

3. Where incubators are used observe the following: Temperature and moisture, condition of the room, capac-

ity of incubators and number of eggs in each, care of the incubator, the turning and testing of the eggs, the circulation of heat through the incubator, the temperature in the incubator.

4. No child should hesitate to ask any questions.



SUMMER HATCHED CHICKS NEED SHADE. THE COOPS HAVE NO BOTTOMS AND ARE MOVED TO A NEW SPOT EVERY DAY.—*Courtesy Wisconsin Agricultural Experiment Station*

There are always important points arising in observation trips not mentioned in the outline. The trips are made to gain information.

5. Briefly write up where you went, and what you saw.

To the Teacher.—Locate places where these observations may be made, and secure permission to take the class to study the methods.

Exercise 4

CARE OF CHICKS

Object.—To observe the care given to chicks when hatched by means of hens, and by means of incubators.

Explanation.—The hatching of chicks is a simple matter and easily accomplished. The raising of chickens is a more difficult problem. The critical period is the first month of their lives. How they may be brought through this period successfully is the subject matter of this exercise.

Procedure.—1. With your teacher visit one or two places where chicks are successfully raised with hens, and note the location of the coops.

2. How are the coops kept clean? How often are they moved? How protected in bad weather?

3. Inquire what ration is being fed and how often the chicks are fed.

4. How is the drinking water kept clean?

5. If possible visit a place where chicks are artificially raised.

6. Examine the brooders. Where are they kept?

7. How are the brooders kept warm? How many chicks are put in a brooder?

8. Find out what and how often the chicks are fed.

9. How often are the floors of the brooders cleaned? Is any material used as litter on the floor?

10. Make a drawing of a coop and of a brooder.

11. Briefly write up where you went and what you saw.

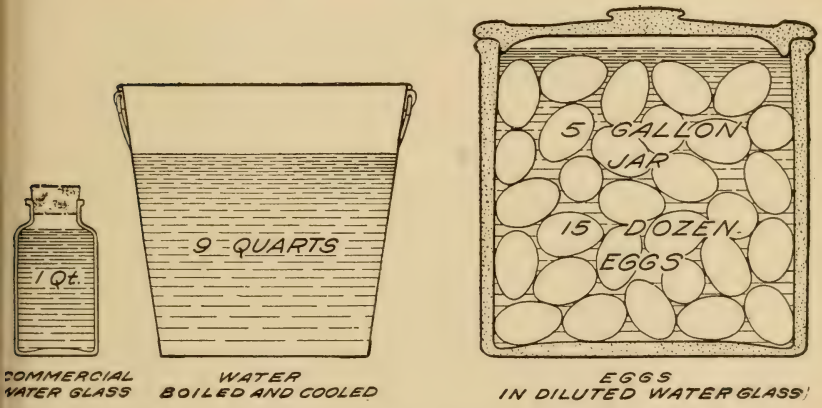
To the Teacher.—Make arrangements beforehand with successful poultry raisers for a class demonstration.

Exercise 5

PRESERVING EGGS

Object.—To learn how to preserve eggs.

Explanation.—There are two common methods of preserving eggs at home. These are the water-glass method, and the lime solution method.



IT PAYS TO PUT DOWN EGGS WHEN THE PRICE IS LOW.—*Courtesy U. S. Department of Agriculture*

Materials.—Two quart Mason jars, a little water glass, and lime, and one dozen eggs. Water glass may be purchased in any drug store.

Procedure.—1. In this demonstration, the class should preserve 6 eggs in a Mason jar containing the water-glass solution and 6 eggs in the lime solution. If they cannot be kept in a cool place at school, one of the

pupils should take the jars home and put them away in a cool, dark place for a period of four to six months.

2. Water-glass method.—Add one part of water glass (about ¼ of a glass) to nine parts of boiled water (about a quart) which has been allowed to cool. Stir the mixture thoroughly and almost fill a quart Mason jar with it. Put six eggs in the jar and lightly screw on the top. Keep the jar in a cool cellar and see that the eggs are always covered with about two inches of the liquid.

3. Lime solution method.—In this method, one pound of quick or stone lime is used with one gallon of water and a half pound of salt. Weigh out enough lime and salt for 1 quart of the solution. How much of these will be needed? Slack the lime with a little hot water. Mix the slacked lime with the required amount of water and add the salt. Stir the mixture thoroughly and allow to settle. Pour off the clear solution into a Mason jar and use it for preserving the eggs. Put six eggs into this and keep the jar covered. Also keep it in a cool place.

4. After a period of 4 or 6 months, use eggs from both jars. Did they keep equally well in both solutions? When may eggs be preserved in these solutions?

5. Large earthenware crocks should be used for preserving eggs for home use.

6. In your notes briefly describe these two methods of preserving eggs.

Exercise 6

EXAMINATION OF COMMERCIAL FERTILIZERS

Object.—To get familiar with the appearance, composition, solubility, and reactive action toward litmus of commercial fertilizers.

Materials.—Samples of commercial fertilizers, several glasses of water, blue and red litmus paper.

Procedure.—1. The results of this exercise should be tabulated in the form suggested below:

	Name of Formula	Color	Form	Solubility in Water	Acidic or Alkaline
1.					
2.					
Etc.					

2. Examine different kinds of commercial fertilizers, especially those used in the community. Note their color and form and record these in suggested forms.

3. Add a little of each to some water in a glass and stir well. Are they soluble? Record results. Test the water containing them with a small piece of blue and red litmus paper and note and record the results.

To the Teacher.—Litmus paper may be purchased in drug stores, or from laboratory supply companies. Samples of commercial fertilizers also may be purchased from laboratory supply companies, or from dealers. (See Appendix, Table 9.)

Exercise 7

MIXING COMMERCIAL FERTILIZERS

Object.—To learn how to compound a certain fertilizer.

Explanation.—Complete or mixed commercial fertilizers are sold on the percentage composition basis. A 4-8-2 fertilizer contains 4 per cent nitrogen or ammonia, 8 per cent soluble "phosphoric acid," and 2 per cent potash. Where much fertilizer is used, there is economy in buying the ingredients and mixing these at home in the proper proportion to get the raw plant food.

Materials.—Table showing composition of fertilizing substances. See Appendix, Table 3.

Procedure.—1. All commercial fertilizers are figured on a ton basis. The following method shows how to mix a 2-8-2 fertilizer.

2% of nitrogen equals	40 lbs. in a ton
8% of phos. acid equals	160 " " " "
2% of potash equals	40 " " " "

These ingredients may be obtained from the following:

250 lbs. of	16% nitrate of soda	will give	40 lbs. of nitrogen
1000 " "	16% acid phosphate	" "	160 " " phos. acid
80 " "	50% chloride of potassium	" "	40 " " potash
1330 " "	material required, and the remainder		

670 lbs. in a ton will be filler containing no raw plant food.

2. In a similar manner show how a 4-6-4 fertilizer may be mixed.

3. Show how a 2-6-8 fertilizer may be mixed.

To the Teacher.—This is a good problem in arithmetic. Assign it for arithmetic and discuss the results when the class meets for agriculture.

Exercise 8

STAKING OUT THE GARDEN

Object.—To learn how a garden is staked out according to a plan.

LEARNING THE PRACTICAL APPLICATION OF ARITHMETIC.—*Courtesy Massachusetts State Board of Agriculture*

Explanation.—This is an excellent observation lesson in which many of the boys and girls in the school may take part.

Materials.—Tape line, yard sticks, and small stakes. Two stakes will be required for each row on the plan

and four for the corners of the garden. Narrow strips, about an inch wide, made from cedar shingles will answer.

Procedure.—1. This exercise may be best demonstrated at the time the first planting is to be done, at the home of a member of the class who has made an accurate plan of his garden, as outlined in Exercise 2, March.

2. Place the four corner stakes.

3. At each end of the garden place a stake at the proper distance to mark each row. The distances between the stakes should be equal to that designated on the plan.

4. What is gained by staking out the garden before planting?

5. Briefly write up how you staked out a garden.

Questions

1. What is gained by staking out a garden before doing any planting?

2. Need a large garden, cultivated with horse-drawn implements, be staked out? How are the rows to be planted, indicated in such gardens?

Exercise 9

PLANTING THE GARDEN

Object.—To observe how to plant the seeds in a garden properly.

Materials.—Garden plan, garden line, required seeds.

Procedure.—1. This is another demonstrational exercise, and, if possible, should be conducted at the home

farm of some pupil where an accurate plan of the garden has been made and the garden has been staked out, and made ready to be planted.

2. Stretch the garden line between the two stakes of the first row to be planted.

3. With a stick or hoe, make a furrow directly under

FOR SMALL SEEDS USE THE HANDLE OF THE HOE FOR MARKING OUT THE ROW ALONGSIDE OF THE LINE.—*Courtesy W. Atlee Burpee Co., Phila., Pa.*

the stretched line and deep enough for the kind of seed to be planted.

4. Plant the seeds according to directions.

5. Cover seeds to the proper depth. Remove the line and stretch it between the stakes of the next row to be planted.

6. Firm the soil above the planted seeds with the back of the hoe or with the foot. Why?

7. In like manner, plant all seeds to be planted at this time.

8. Briefly write up the different steps in planting seeds.

QUESTIONS

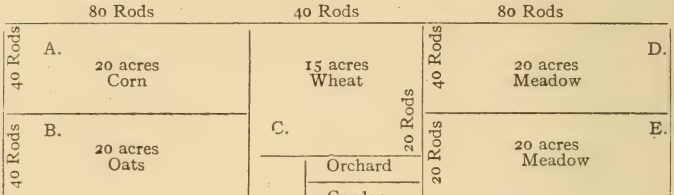
1. What are the advantages of straight rows?
2. Why are some seeds planted deeper than others?

Exercise 10

PLAN OF THE HOME FARM

Object.—To draw an accurate plan of the home farm and to find the number of acres in each field.

Procedure.—1. The plan here given is of a 100 acre farm. It shows the fields,



the orchard, garden, grounds, and buildings. On this plan the scale used is,—5 rods equals ⅛ of an inch.

2. Draw a plan of the home farm getting the distances on all sides of the fields from your father and, wherever in doubt, actually measure them.

3. If time permits, make a large plan of the farm in which the scale is 5 rods equal to one inch, and indicate the crops grown on each field for the last 5 years. This will show the rotation on each field.

Exercise 11

FORAGE CROPS SURVEY

Object.—To make a survey of the number of acres devoted to forage crops in the school district.

Procedure.—1. The following outline is suggested for this survey.

Forage Crops Survey

School Dist. No..... Town of..... Co.....
Date.....

	Name of Farmer	Acres in Timothy	Total Yield	Acres in Clover and Timothy	Total Yield Tons	Acres in other Forage Crops	Total Yield Tons
1.							
2.							
3.							
4.							
Etc.							

2. For directions in conducting this survey, see Exercise 11, September.

3. In place of the column headed "Other Forage Crops" alfalfa may be used, or the name of any other crops raised for forage purposes in the community.

Exercise 11

GARDEN DIARY BOOKLET

Object.—A garden booklet for young boys in which they may keep any or all of the following items:

Dates on which different vegetables were planted.
The first vegetables to appear.
List of vegetables planted.
List of flowers planted.
Insects seen in the garden.
Birds seen in the garden, dates.
First flower to bloom.
First flowers picked.
First vegetables used. Date.

To this may be added other items. This material will offer excellent language and composition lessons.

THINGS TO OBSERVE IN APRIL

Incubators in operation
Brooding of chicks
Preparation of a seed bed
Liming soils
Spreading fertilizers
The birds
Opening of buds

Project 1

HATCHING AND RAISING CHICKS

Object.—To hatch one or more sittings of eggs from pure bred stock and to raise the chicks.

Explanation.—This project should be started early in April and continue until November 1. The pupil should do all the work necessary in hatching and raising the chicks except that which must be done while he is in school, when the necessary work may be done for him. Accurate records of cost of eggs, feed, and other cash expenses should be kept. If desired, labor records may also be kept.

Preparation.—Study the matters related to this project as outlined below.

1. What breed of poultry shall I raise?
2. Do I want to raise the chickens for meat, eggs, or both?
3. Where can I get good eggs from pure bred stock at reasonable prices?
4. What hens can I get for hatching the eggs?
5. Where should I put the nest? How feed the sitting hen?
6. Where and how should I keep the hen and chicks?

AN ORCHARD IS AN IDEAL PLACE TO RAISE YOUNG CHICKENS.—*Courtesy Missouri Poultry Experiment Station*

7. What and how often should I feed the chicks?
8. How should I manage the growing chicks?

Procedure.—1. Get a clear idea of all the points involved in the project, and get everything ready to start the project.

2. Keep records in an ordinary composition book such as you use in school.

3. Use the first page for the table of contents. Use the second page for the following:

1. Breed of poultry raised.
2. Number of eggs and cost.
3. Date eggs were set.
4. Number hatched? Percentage?
5. Number raised up to November 1.

4. Reserve two or three of the following pages for expenses, recording these in the order they occur.

5. If labor records are kept, use one page for each month and record as accurately as possible the number of minutes devoted to the project each day.

6. Use one sheet for receipts, recording what birds, if any, were sold. Sell all the cockerels.

7. November 1st, make out a summary sheet showing cost of chicks, not including labor, as suggested.

Cost of eggs.....
Cost of feed.....
Other cash expenses.....
Total Cost.....

Deduct from this all the sales.

8. If possible, sell all the cockerels. If they are pure bred you should get a good price for them. Use the pullets to start, on November 1st, an egg laying project as outlined in Project 2, November.

References.—F. B. 562: Boys' and Girls' Poultry Clubs. F. B. 898: Mediterranean Class of Chickens. F. B. 806: American Class of Chickens. F. B. 530: Hints to Poultry Raisers. F. B. 624: Brooding Chicks. F. B. 889: Backyard Poultry Keeping. F. B. 957: Poultry Diseases.

To the Teacher.—A few similar projects are goose, duck, and turkey raising. Hints for these projects can be found in: F. B. 767: Goose Raising; F. B. 791: Turkey Raising; F. B. 200: Turkeys, 5c., F. B. 697: Duck Raising. Dept. Bul. 464, Lessons on Poultry for Rural Schools, 10c.

Project 2

RAISING A CALF

Object.—To raise a calf.

Explanation.—Calf clubs for rural school boys and girls have been organized in practically every state, and any boy or girl may take up this project and, if desired, enter a club. In this project, as in all others, all the work must be done by the pupil, except that which must

be performed when he is in school or is sick. The calf should preferably be a pure bred or grade female. The project should be started in the spring and continue until the fall. If possible, the calf should continue to be the property of the pupil and later be used in a milk producing project. Before starting the project get a clear idea of what is necessary to conduct it successfully. The calf should be your property, paid for out of your own pocket, and not given to you. You should either pay cash for it, or have your father loan you the money to buy it, or you should work out its cost. The records should show the value of the calf when the project is started.

Preparation.—1. Where and how am I going to get a good calf?

2. What breed of calf should I get?

3. Where and how am I going to keep it?

4. Where am I going to get the feed? Have I money to buy it? Shall I ask father to loan me the money? Can I do work for him for the feed?

5. How can I weigh the calf occasionally?

6. What shall I feed it to make it grow well and keep healthy?

7. Where and how can I manage to keep it when I close up the project in the fall?

Procedure.—1. Prepare to keep records. Read Project 1, April, and Project 2, December. Enter in your record book the following:

1. Breed of calf.
2. Date of birth.
3. Age when taken.
4. Pure bred or grade.

5. Sire's name ..... No. ..
6. Dam's name ..... No. ..
7. From whom purchased.
8. Purchase price.

2. Open a feed expense account in your record book, and charge all items of feed,—weight and value,—as you purchase them, in order, including the whole and skim milk.

3. Enter all other items of expense.

4. When you close up the project, fill out a summary feed table as suggested:

SUMMARY FEED TABLE

Feed	Pounds Fed	Price per Lb. Hundredweight of ton	Total Cost
1. Whole milk.....			
2. Skim milk.....			
3. Grain.....			
4.			
5.			
6. Hay.....			
7. Silage.....			
8. Pasture.....			
Totals.....			

For pasture put down what your father would charge for pasturing a calf for a neighbor.

5. Finally fill out the following summary:

1. Date when project started.
2. Date when project closed.
3. Weight when entered on project.
4. Weight at close of project.
5. Total gain in pounds.
6. Average daily gain.
7. Cost of feed.
8. Cost of 100 lbs. gain in weight.

6. Prepare to do the work well. Enter all expenses promptly, and if scales are available, weigh the calf every 30 days.

References.—F. B. 777: Feeding and Management of Dairy Calves. F. B. 893: Breeds of Dairy Cattle. F. B. 612: Breeds of Beef Cattle. F. B. 811: Production of Baby Beef.

To the Teacher.—The State Leader of Boys' and Girls' Club Work, located at your State Agricultural College, will gladly mail you leaflets pertaining to calf projects. Write to him.

MAY

Exercise 1

EFFECT OF LIGHT UPON PLANT GROWTH

Object.—To study the effects of light upon a growing plant.

Explanation.—This is a demonstrational exercise in which the class, as a whole, should assist. Each member should briefly write up the experiment and answer the questions.

Materials.—Two tin cans with holes punched in the bottoms and around the sides near the bottoms; oats.

Procedure.—1. Mix two parts of a rich garden soil with one part coarse sand, and fill the two tin cans with the mixed soil.

2. Plant about ten oat kernels in each pot. Water the soil regularly and put the cans where the plants will grow well.

3. When the oats are about three inches high, put one of the cans in a dark place for three or four days, then compare its plants with those of the other can. What changes were caused by the absence of sunlight?

4. Keep the two cans in the lighted place for several days longer and note the effect the sunlight has upon the plants which have been in the dark. What are some of the effects of sunlight upon plant growth?

QUESTIONS

1. Of what use is the green coloring matter of plants?

2. Would this coloring matter be of any use to plants deprived of sunlight?

3. Why is sunlight essential? See Chapter 2 in "An Introduction to Agriculture" or how plants make food, in any agricultural text book.

Exercise 2

CIRCULATION OF WATER IN PLANTS

Object.—To show how water circulates in a plant.

Explanation.—See previous exercise.

Materials.—Glass of water containing a few drops of red ink, one or two white flowers with long stems such as the lily of the valley, or white carnation.

Procedure.—1. Insert the freshly cut ends of one or two of the flowers mentioned, in the colored water in the glass.

2. At intervals of about one half an hour examine the plants to discover how far up the stems the red solution has moved.

3. Did the red solution color the white petals? How long did it take?

4. Hold a few of the petals and leaves up to the light and see if you can see the veins in which the water circulates? Are they very numerous?

QUESTIONS

1. Does much water circulate through plants?

2. Why does the water go up into the leaves of plants?

3. Does the water circulating through plants have any particular uses? (See Chapter 4, "An Introduction to Agriculture.")

Exercise 3

SOIL TESTS

Object.—To study the effects of commercial fertilizers and of lime upon plant growth.

Materials.—About a pound of each of the following: nitrate of soda, acid phosphate, chloride of potassium, and 2 pounds of slaked lime.

Explanation.—This is a demonstrational exercise in

ON THE LEFT, CLOVER ON UNFERTILIZED PLOT. ON THE RIGHT, CLOVER ON SOIL TREATED WITH GROUND LIMESTONE AND ACID PHOSPHATE.—*Courtesy Kentucky Agricultural Experimental Station*

which the whole class should take part. The demonstration should be carried on in a field near the school, and should be started a day or two before the crop, which may be wheat, oats, potatoes, corn, alfalfa or clover, is planted.

Procedure.—1. Assist your teacher in laying off four strips of ground, 10 feet square, with a space of three feet between them, on one edge of the field.

2. Broadcast over these four strips, respectively, one pound of nitrate of soda, one pound of acid phosphate, one pound of chloride of potassium, and two pounds of slaked lime.

3. Rake the materials into the soil.

4. While the crop is being planted the stakes may be temporarily taken out and later, after the planting, be put back in some places.

5. The demonstration plats should be a regular part of a field and should receive the same treatment in planting and care as the rest of the field.

6. Note carefully the rate of growth, the vigor, and the color of the crop on each plat, and compare it, in each case, with the strips between the plots on which no fertilizers were applied.

7. This is a good practical method of determining what elements of plant food, if any, do not occur in sufficient quantities in the soil.

8. Briefly write up the tests that were made; and the results obtained.

To the Teacher.—Secure permission to conduct such a test and have all the materials on hand.

Exercise 4

TRANSPLANTING

Object.—To learn how to transplant seedlings into the garden.

Materials.—A flat of tomato, cabbage, or cauliflower plants.

Explanation.—This is a demonstrational exercise in which the whole class should take part, the pupils doing just as much of the work as possible.

No plant should be taken directly from a warm room or hotbed and exposed suddenly to open weather conditions. The change should be made gradually by exposing the plants on warm days, then on warm nights,

PROPER THINNING IS ESSENTIAL FOR GOOD RESULTS. DON'T JUST PULL THE PLANTS UP BUT USE A STICK TO LOOSEN THE SOIL AROUND THE ROOTS BEFORE REMOVING. *Courtesy W. Atlee Burpee Co., Phila., Pa.*

and finally on cool nights. Besides exposing the plants to the open, they should also be made accustomed to the dryer conditions of the outdoor air, by giving them during the week before they are transplanted only enough water to keep them healthy. The plants should be watered an hour or two before transplanting to fill their tissues with water. The best time to transplant is on the evening of a cloudy day, either before or after a rain.

Procedure.—1. Transplant some plants following directions here given.

2. Remove the plants with as much soil adhering to the roots as possible.

3. Make a hole in the ground deep enough to allow the plants to be set down to the first leaves, and insert the plant to the proper depth.

4. Cover the roots with some fine soil. Press this down firmly to fill up all air spaces and to bring the soil in close contact with the roots.

5. Add water to moisten the soil thoroughly and when this water has disappeared fill the rest of the hole with loose soil. Do not firm this, as it should act as a mulch to check evaporation.

6. Tomato plants with long stems should be transplanted differently. Make a hole deep and long enough to lay the roots in the trench and turn up the tops of the plants.

7. The tops of beets, tomatoes, celery, etc., may be partly sheared to reduce the evaporation from the plant.

8. If the following day is bright and warm, protect the plants.

9. In your notes briefly tell how you transplanted some seedlings.

Exercise 5

NODULES AND LEGUMES

Object.—To study the nodules on the roots of legumes.

Materials.—Several different legumes, spade.

Explanation.—This is an observational exercise and should be taken up on a field trip.

NODULES ON A SWEET CLOVER ROOT.—*Courtesy International Harvester Co.*

Procedure. — 1. Carefully dig up a number of different leguminous plants such as sweet clover, red clover, alfalfa, and garden peas. Be careful not to break off the tiny roots.

2. Gently shake the soil from the roots and notice the small swellings attached to the roots. These are called nodules or tubercles. Draw and describe them.

Questions

1. Where do they occur on the roots? How do those of different varieties of plants differ?
2. What use have these nodules?
3. What is in them?
4. What may be the results if a legume had no nodules? (See Chapter 8, "An Introduction to Agriculture.")

To the Teacher.—When you take this exercise up with the class, take the pupils out and have one or two of the boys dig up some legumes for study.

Exercise 6

MAKING SPRAYING SOLUTIONS

Object.—To make a gallon of each of the different spraying solutions.

A TYPE OF SPRAYER, EASILY HANDLED BY A BOY OR GIRL, WHICH GIVES EXCELLENT RESULTS.—*Courtesy U. S. Department of Agriculture*

Materials.—Copper sulphate, quicklime, arsenate of lead, Paris green, small scales.

Procedure.—See A, B, C, for formulas for different mixtures.

A Preparation of Bordeaux Mixture.

The formula for common Bordeaux mixture is: 4-4-50, meaning,

4 lbs. of copper sulphate
4 lbs. of quicklime
50 gal. of water

1. How many ounces of the ingredients are needed for 1 gallon of water?

2. Weigh these out.

3. Good lime for this purpose should be lumpy. Slake the lime with hot water. Add the water no faster than it is taken up. When the lime has formed into a light powder, slowly add two quarts of water to get it into solution.

4. Dissolve the required amount of copper sulphate in two quarts of water.

5. Mix the two solutions, and test the mixture with an iron wire slightly filed at one end. If the amount of lime is insufficient, copper will be deposited on the bright part of the wire. In this case, add more lime until the copper no longer deposits on the wire.

B. *Paris Green Solution.*

The formula for the standard Paris Green solution is

Paris green.....	1 pound
Lime	2 pounds
Water	200 gallons

1. How many ounces of these two ingredients are needed for 5 gallons of the solution?

2. Make the Paris green into a paste with a little

water, then dilute the paste with more water. Mix the lime as for Bordeaux mixture.

3. Do not prepare this solution unless it can be used.

C. *Arsenate of Lead Spray.*

The most common formula for arsenate of lead is 2-50; that is,

2 pounds of arsenate of lead
50 gallons of water

1. How many ounces of lead arsenate are required for 5 gallons of water?

2. If the solution can be used, make it. Add the arsenate to a little water to make a paste; then add the rest of the water.

3. Paris green or arsenate of lead may be combined with Bordeaux mixture if a combined fungicide and insecticide is desired. Generally ¼ lb. Paris green or 2 lbs. of arsenate are added to 50 gallons of Bordeaux mixture.

To the Teacher.—Let the class working in one or more groups prepare small quantities of these spraying solutions. Do this at a time when you can take the class to a farm near by to demonstrate with several types of small sprayers the use of the solutions, spraying such plants as potatoes, cabbage, melons and tomatoes with the proper solutions.

Exercise 7

EAR-TO-ROW CORN TEST

Object.—To plant short rows of corn from different ears, each row representing one ear, and to note the results.

Materials.—Ears of corn, hand planters or hoes.

Explanation.—This is a demonstrational exercise requiring the work and coöperation of the entire class. The demonstration should be conducted in a field near

LEFT. ROWS PLANTED FROM EARS WHICH GREW LOW ON PLANTS. RIGHT. FROM EARS WHICH GREW HIGH ON PLANTS. IT PAYS TO SELECT CORN FROM PLANTS IN THE FIELD.—*Courtesy Ohio Agricultural Experiment Station*

the school about to be planted to corn, and should be started about ten days before the owner of the field intends to plant it. The test consists in planting the ends of 10 to 20 corn rows nearest the road, to corn, in

such a way that about 50 feet in each row is planted with corn from individual ears. The end of each of these rows should represent a single ear. The ends of the rows used in the test should be cultivated by the farmer whenever he cultivates the corn. The corn should be given to the farmer in return for the permission to run the test.

Each member of the class should briefly write up the demonstration and should make a plan of the test plot.

Procedure.—1. About two weeks before the corn is to be planted secure and test about 50 ears of corn of the same variety as that which the farmer is going to use in planting the field.

2. When the tester is opened, select a variety of ears if possible, some testing very weak, some weak, and some strong, but only as many ears as there are rows in the test.

3. Plant the end of row one to corn from ear one and so on, and keep the data about the test of each ear.

4. Observe from time to time the growth of the corn.

5. Which row seems to have the largest and most vigorous plants? How did the corn planted in this row test? Which row has the weakest plants? How did the corn used in this row test?

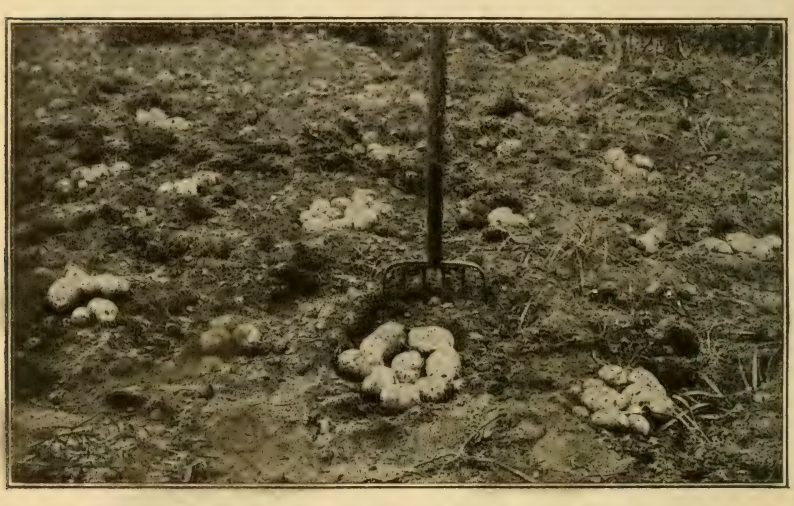
6. The stalks of the poor corn may be detasseled to prevent crossing without any effect upon the plants. This will eliminate any possibility of injury to the quality of the corn the farmer plants in the field.

To the Teacher.—Secure permission from a farmer near by to conduct this test.

Exercise 8

POTATO TESTS

Object.—To plant a few dozen hills of potatoes from each of three or four varieties grown in the community, to see which variety gives the best results.



CUT ILLUSTRATING HILL SELECTION OF SEED POTATOES. IT PAYS TO SELECT POTATOES FROM THE BEST HILLS FOR SEED.—*Courtesy U. S. Department of Agriculture*

Materials.—Eight to ten good seed potatoes from three or four standard varieties.

Explanation.—This exercise should be conducted on a potato field of a near-by farm as was the corn exercise outlined in the previous exercise. The only work this will make for the school will be the cutting and the planting of the potatoes. It is assumed that these potatoes will finish out rows of a regular potato field

and that when the field is cultivated and sprayed the experimental plot will receive the same treatment as the rest of the field. The crop should go to the farmer for the use of the land. A spraying demonstration may be introduced if desired.

Procedure.—1. Cut the potatoes on the day the farmer is going to plant the field. See Exercise 2, April.

2. Plant them at the same distances apart as the regular field of potatoes is being planted.

3. Observe, at occasional intervals, the characteristics of the plants and flowers and the growth of each variety planted.

4. In the fall, have the potatoes dug by hand, digging and weighing separately the marketable potatoes of each variety, from an equal number of hills, to determine the comparative yields.

5. Weigh the crop from an equal number of hills from the farmer's potatoes. Discuss the results. Was there any noticeable difference in yield? In favor of which variety?

To the Teacher.—This is an excellent method of getting samples of common varieties of potatoes for study in Exercises 2 and 3 outlined for September. *See* F. B. 533: How to Produce Good Seed Potatoes.

Exercise 9

POULTRY SURVEY

Object.—To make a poultry survey of the school district.

Procedure.—1. The following is a suggested outline for a poultry survey, or census of the school district:

POULTRY SURVEY

School Dist. No..... Town of..... Co.....
Date.....

	Name of Farmer	Number of Chickens	Breed	Number of Ducks	Number of Geese	Number of Turkeys
1.						
2.						
3.						
4.						
Etc.						

2. Conduct this survey exactly as outlined for the Corn Survey, Exercise 11, September.

Project 1

GROWING A PLOT OF BEANS

Object.—To grow a plot of navy beans.

Explanation.—The growing of navy beans is always a good project because there is a constant demand for the crop at good prices. Beans keep well, the crop is easily handled, and, with the exception of preparing the land, a boy or girl can do all the work himself. A patch covering about 1/10 of an acre, if well cared for, should yield from one to two bushels of shelled beans.

Preparation.—Some of the more important factors entering into this project are enumerated below. Study them before you start the work.

1. What kind of a soil is best adapted to beans?
2. Will beans grow well on a sour soil?
3. Where on our farm is the best place to grow the beans?
4. Should the field be fertilized? With what?
5. What variety of beans is best adapted to our locality?
6. Where can I buy the best grade of seed, guaranteed free of disease? Should I test the seed? How?

7. How should I plant the seed? How thick? How deep?
8. How much seed shall I need?
9. How should the seed bed be prepared?
10. When should I plant the seeds?
11. How, when, and how often should beans be cultivated?
12. How should I harvest and cure the crop?
13. How should I thresh them?

Procedure.—1. Prepare a record book in which all expenses and time devoted to the project may be recorded. See Project 3, March.

2. In the record book, draw to an accurate scale the plot, indicating number of rows and the distance between the rows. Give the dimensions of the plot. Determine the number of square rods in it. Determine what part of an acre it is.

3. Devote several pages to the expenses which should include

1. Land rental
2. Cost of seed
3. Cost of preparing field
4. All labor not your own
5. Cost of any fertilizer used
6. Other expenses

4. On separate sheets keep track of your time.

5. When the project is completed fill out a summary sheet as directed.

1. Cost of seed .....
2. Other cash expenses.....
3. Total expense, not including your time.....
4. Value of the crop.....
5. Profit (not counting labor).....

6. Value of labor.....
7. Net profit .....

Under value of crop give value of the beans sold and of those kept for home use; also record the yield.

6. Start all work at the proper time.

7. Pay attention to the points you learned about growing the crop.

8. Record all expenses and all time items on the days they occur.

References.—F. B. 289: Beans. F. B. 907: Bean Growing. Bul. 19: Bean Production, published by Soil Improvement Committee, Postal Telegraph Building, Chicago, Illinois. Free.

To the Teacher.—See the next project. Other similar projects are growing a plot of pop corn or sweet corn. In helping a child to select a project of this kind the market demands must be carefully considered. The parents may be able to help you to decide what crops would be most profitable to grow.

Project 2

GROWING A PLOT OF CORN

Object.—To grow a plot of corn.

Explanation.—The size of a land plat for a corn project for rural schools varies from 1/10 of an acre to one acre. The aim of the project is to raise the largest quantity and the best quality of corn at the cheapest cost of production. Nothing but pure bred corn of a variety grown in the community should be used for seed.

Preparation.—1. Before starting this project make a study of the following questions:

1. What kind of soil is best adapted to corn?

2. Where on our farm may I get the best piece of land for my corn project?

3. Should I fertilize it? When? With what?

4. What variety of corn should I plant? Where can I buy pure bred seed? Shall I get shelled corn or ear corn for seed.

5. Should I test the seed?

6. How should I plant the corn? How thick?

7. How should I plant the seed?

8. How and how often should I cultivate the crop?

Procedure.—1. Purchase and test the seed.

2. Make preparations to have the land fertilized and plowed.

3. Keep accurate records of the project. See Procedure under Project 1, May.

4. Prepare the seed bed. Plant the crop.

5. Cultivate the crop.

6. Keep accurate records and record all items each day.

7. Close up the project with a summary sheet as suggested in Project 1, May.

PLANNING TOGETHER FOR A BUMPER CROP.—*Courtesy Iowa State Teachers' College*

8. In a project of this sort, in which horses and implements are used, charge 10 or 15 cents per hour for your time, 10 cents per hour for the time of each horse used, $2.00 per acre for rental of implements, and $5.00 per acre for rent of land.

Other projects of this kind are:—

Growing a plot of potatoes
Growing a plot of tomatoes.
Growing a plot of onions.

References.—F. B. 948: The Rag Doll Tester. F. B. 400: Methods of Planting Corn. F. B. 414: Corn Cultivation. F. B. 415: Seed Corn. F. B. 537: How to Grow an Acre of Corn.

THINGS TO OBSERVE IN MAY

Tillage implements
Spraying machines
Good gardens
Planting of farm crops
Planting of a garden
The birds and insects of the garden
Weeds in the garden
Some well planned home gardens
The opening of buds
Insects pollinating flowers

JUNE

Exercise 1

A STUDY OF FLOWERS

Object.—To make a study of the different parts of a flower.

Materials.—Several simple flowers, hand magnifier, knife.

Procedure.—1. Procure one or two simple flowers in blossom at this time.

2. Note the shape of the flower. Has it an odor? Where is the odor produced? Why?

3. What is the color of the flower? Why are some flowers brightly colored? What flowers have no color? Why not?

4. The lower, outer set of parts of the flower, just below or surrounding the colored parts, are called the sepals. How many sepals are there? What name is given to all the sepals taken together?

5. The colored parts of the flower, just inside or above the sepals, are the petals. How many petals are there? What collective name is given to the petals?

6. The group of small structures inside of the petals are called the stamens. How many stamens are there? Of how many parts does each consist? What use have the stamens? Shake the flower over a piece of paper.

Does a powdery mass drop from the flower? What is this?

7. In the center of the circle of stamens is the pistil. It has three parts. What is the use of the pistil? The swollen lower part of the pistil is the ovary. In it the seeds develop. Cut an ovary cross-wise and look at the cut section with a hand magnifier. Can you see the little seeds?

QUESTIONS

1. How do flowers form seeds?
2. Why do not all flowers have colored petals?
3. What part of a flower is the silk on an immature corn plant?

Reference.—Any botany book.

Exercise 2

A STUDY OF INSECTS

Object.—To study a few insects.

Materials.—June beetle, and other insects.

Procedure.—1 Notice the body parts of the insects;—the head, thorax, and abdomen.

2. What is attached to the thorax?

3. How many pairs of legs have the insects? To what part of the body are these attached?

4. How many pairs of wings have the insects? To what part of the body are these attached? What is the difference between the two pairs of wings?

5. How many parts or segments has the abdomen?

QUESTIONS

1. How do insects breathe? Can you see their breathing pores?

THE LEGS AND WINGS ARE ATTACHED TO THE THORAX

2. Could you drown an insect by putting its head under water?

3. Can you give an account of the complete life history of a June beetle?

4. If possible, examine some of the grubs and pupæ.

References.—F. B. 543: Common White Grubs. F. B. 747: Grasshoppers. F. B. 76; The Common Cabbage Worm. Any zoology text book.

Exercise 3

THE LIFE HISTORY OF A FLY

Object.—To make a study of the life history of a fly.

Materials.—An empty cigar box or old bucket, a piece of fresh meat, a piece of cheese cloth.

Procedure.—1. Half fill an empty cigar box or old bucket with some moist soil and place upon the soil a piece of fresh meat.

2. Expose the meat to the open air for a few hours, or until you have seen some flies hovering about it.

3. Observe the meat carefully and notice if you can see any small eggs deposited by the flies upon it. If so,

cover the top of the receptacle with a piece of cheese cloth and keep it in a warm place.

4. Examine the meat daily for little maggots or larvæ. How long has it taken the eggs to change to larvæ?

5. Several days after the maggots have all disappeared stir up the soil two or three times, at intervals of a few days, and see if you can see any pupæ. How long has it taken a larva to change to a pupa?

6. Keep the receptacle covered. Examine it daily for flies? How many days has it taken the pupæ to change into flies? Flies undergo a complete metamorphosis in their development. Name each stage in the complete life cycle.

7. Mention other insects which undergo a complete metamorphosis.

8. Do grasshoppers undergo similar changes in their development?

References.—F. B. 459 and 851: House Flies. F. B. 540: The Stable Fly. Any zoology text book.

To the Teacher.—Have each member of the class perform this experiment at home, or else let one or two of the boys work it at school to demonstrate it to the class.

Exercise 4

POULTRY PESTS

Object.—To study poultry pests and to learn how to exterminate them.

Explanation.—The common poultry pests are mites and lice. The most troublesome is the mite, a little gray insect which becomes red after it has sucked blood from the poultry. Poultry lice have a pale dull yellow color and when seen under a hand magnifier show a segmented

body. Lice gnaw the surface of the infected animal and eat the blood and tissue. The body of mites is not segmented.

Materials.—Poultry, hand magnifier.

Procedure.—1. With your teacher visit a nearby poultry house to study mites and lice. Examine also the poultry house and the chickens at your home.

2. Look carefully in the cracks and crevices of the perches and nests for mites. Brush some on a piece of paper and look at them with a hand magnifier. Mites in general infect the poultry only at night or when a hen is brooding or laying.

3. Lice are usually found on the poultry, between the feathers, about the thighs, and rear of the body. Examine several hens for lice. Put one or two on a piece of paper and observe them with a hand magnifier.

QUESTIONS

1. How can mites and lice be exterminated?
2. What harm do lice and mites do? See F. B. 801; Mites and Lice on Poultry. Any poultry book.

To the Teacher.—Make arrangements for the class with a farmer where it is possible to see these poultry pests or have the pupils do the work at home.

Exercise 5

STUDY OF A GARDEN

Object.—To observe and study a well planned, well planted, and well cared for garden.

Explanation.—Near all schools one should be able to find at least one really good garden. Much may be learned about gardening by observing a really good gar-

den. The class should go with the teacher to study a garden as suggested below.

Procedure.—1. Make a plan of the garden, indicating dimensions, each row of vegetables, and distances between the rows.

A WELL PLANNED GARDEN. TOMATOES ARE BEING TRAINED TO STAKES.—*Courtesy Indiana Agricultural Experiment Station*

2. Get the intervals between corn, potatoes, tomatoes, etc., in the row.

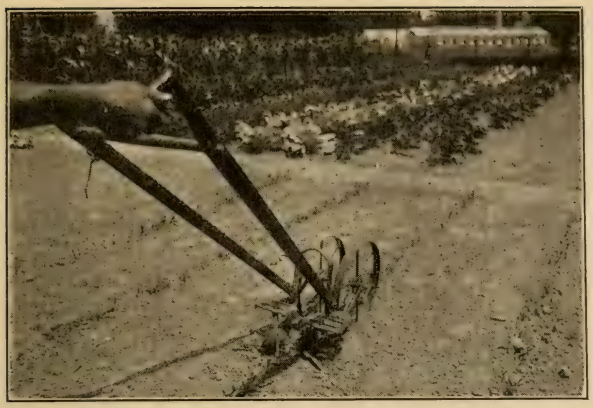
3. Ask when and how the garden was prepared.

4. Ask when and with what the garden was fertilized.

5. Ask why certain crops were planted in certain places.

6. Find out if any spraying has been done. If it has, what was used, and for what purpose?

7. Ask any questions which you think will help you in your garden work.



A WHEELED HAND CULTIVATOR MAKES GARDEN WORK EASY AND PRODUCES EXCELLENT RESULTS.—*Courtesy W. Atlee Burpee*

Exercise 6

SPRING WEEDS

Object.—To get familiar with the names and characteristics of some of the early summer weeds.

Procedure.—1. Read over Exercise 4, September, Fall Weeds.

2. In studying spring weeds follow either one of the two suggested ways of studying weeds given in Exercise 4, September.

3. Make a list of the common weeds found in the garden at this time.

Exercise 7

KEEPING MILK SWEET

Object.—To learn what effect temperature has upon keeping milk sweet.

Explanation.—Each member in the class should try this test at home.

Materials.—Two pint Mason jars each half filled with sweet milk.

Procedure.—1. Keep one of the jars of milk in a warm place and the other in a cold place, ice box if possible.

2. Examine both samples daily and find out which one sours first.

QUESTIONS

1. What causes milk to sour?
2. Would dirty milk and clean milk kept in the same warm place sour at the same time?
3. Why does a low temperature check souring?

Reference.—F. B. 976: Cooling Milk and Cream on the Farm.

Exercise 8

SWINE SURVEY

Object.—To make a swine survey of the school district.

Procedure.—The following is a suggested outline for a swine survey of the school district:

SWINE SURVEY.

School Dist. No..... Town of..... Co.....

Date..... .....

	Name of Farmer	Number of Sows	Breed	Number of Boars	Breed	Number of Pigs
1.						
2.						
3.						
4.						
Etc.						

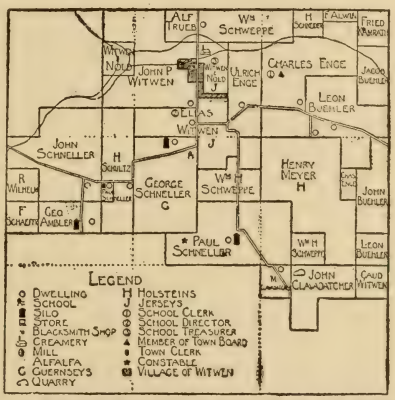
2. Conduct this survey exactly as outlined for the Corn Survey, Exercise 11, September.

Exercise 9

SURVEY BOOKLET

Object.—To combine all the different surveys made of the school district into one booklet and to draw a map of the district on which some of the important agricultural facts are recorded.

Explanation.—The survey booklet, if it contains the surveys suggested for each month, will be a piece of work which will reflect great credit upon the pupil. It will show the agricultural conditions of the district, and, should interest the whole community. Many counties throughout the United States have been surveyed by the school children, and one entire state.



A SCHOOL DISTRICT SURVEY MADE BY RURAL SCHOOL STUDENTS.—*Courtesy Wisconsin Agricultural Experiment Station*

Procedure.—1. Make an index of the surveys in the booklet.

2. Draw a map of the school district as suggested, and on it indicate the most important facts deducted from the survey.

3. Neatly bind the material together with colored construction paper to form a neat booklet.

Project 1

SUMMER WORK

Object.—To keep record of any definite piece of work done during the summer which has not been taken up under the heading of any projects listed in this book.

Explanation.—If during the school year, no definite projects have been started, which will run into the summer months requiring some definite summer work from the pupils, every boy or girl should think of what he can and would like to do and should talk over this matter with his parents. No boy or girl among you should aimlessly while away a whole summer. Let part of your time be devoted to some worth-while project which, when carried on regularly and in a good business-like manner, will show that your summer vacation has not been wasted.

Procedure.—1. Read over some of the projects which have been outlined.

2. Think of what you can do and would most enjoy doing and being responsible for. Consult your parents.

3. Plan the work. Keep records of what you do, be able at the close of the summer to show a neat booklet, giving all the information about your project.

THINGS TO OBSERVE IN JUNE

Some good stands of corn
Some well managed chicks
A good alfalfa field
Leaves of common trees
The work of earthworms
Injurious insects
Good cultivation
Well pruned trees
A bee hive

APPENDIX

APPENDIX

Table 1

AVERAGE NUMBER OF POUNDS OF DIGESTIBLE NUTRIENTS IN ONE HUNDRED LBS. OF FEED
(From Henry's "Feeds and Feeding")

Name of Feed	Total Dry Matter in 100 Lbs.	Digestible		
		Protein	Carbo-hydrates	Fat
Concentrates	Lbs.	Lbs.	Lbs.	Lbs.
Corn—grain	89.4	7.8	66.8	4.3
Corn meal	85.0	6.1	64.3	3.5
Corn and cob meal	84.9	4.4	60.0	2.9
Gluten feed	90.8	21.3	52.8	2.9
Wheat—grain	89.5	8.8	67.5	1.5
Wheat bran	88.1	11.9	42.0	2.5
Wheat middlings	88.8	13.0	45.7	4.5
Barley—grain	89.2	8.4	65.3	1.6
Oats—grain	89.6	8.8	49.2	4.3
Oats—ground	88.0	10.1	52.5	3.7
L. Oil meal	90.2	30.2	32.0	6.9
Cottonseed meal	92.6	35.8	23.2	8.0
Cows' milk	12.8	3.4	4.8	3.7
Skim milk	9.4	2.9	5.3	.3
Butter milk	9.9	3.8	3.9	1.0
Whey	6.2	.6	5.	.2
Meat scraps	89.3	66.2	....	13.4
Tankage	93.0	50.1	....	11.6
Roughages				
Timothy	86.8	2.8	42.4	1.3
Red clover hay	84.7	7.1	37.8	1.8
Alfalfa hay	91.9	10.5	40.5	.9
Corn stover	59.5	1.4	31.2	.7
Wheat straw	90.4	.8	35.2	.4
Oat straw	90.8	1.3	39.5	.8
Barley straw	85.8	.9	40.1	.6
Corn silage	26.4	1.4	14.2	.7

Table 2

The table below shows the number of pounds of dry matter and the number of pounds of the three elements of plant food contained in 1,000 pounds of grains, seeds,

cured hay, stalks, stovers, silages, and miscellaneous substances.

Materials	Dry Matter	Nitrogen	Phosphorus	Potassium
Grain and Seeds	Lbs.	Lbs.	Lbs.	Lbs.
Corn	894	16.5	3.1	4.7
Rye	913	18.1	3.8	4.8
Wheat	895	19.0	3.8	4.6
Oats	896	18.2	3.4	4.0
Barley	892	19.2	3.4	4.0
Buckwheat	866	17.3	3.0	2.5
Soybeans	883	53.6	4.5	10.5
Cotton Seed	897	29.4	4.6	9.0
Cowpeas	854	32.8	4.4	10.0
Cured Hays				
Timothy Hay	868	9.4	1.4	11.8
Red Top	911	12.6	1.6	8.5
Red Clover	847	19.7	2.4	15.5
Alsike Clover	903	20.5	2.2	11.5
Sweet Clover	908	27.7	2.5	15.2
Alfalfa	919	23.4	2.7	14.8
Hairy Vetch	887	27.2	4.2	20.2
Oat and Vetch	850	20.5	2.6	10.5
Cured Straws and Stovers				
Wheat	904	5.0	1.0	5.2
Rye	929	5.0	1.1	7.1
Oats	908	5.8	1.3	14.7
Barley	858	7.0	0.9	8.7
Buckwheat	901	8.0	0.6	9.5
Corn Stover (no ears)	595	6.1	1.7	9.0
Miscellaneous				
Potato Tubers	209	34.8	.7	4.8
Sugar Beets	135	24.6	.4	3.1
Corn Silage	264	5.8	.5	3.0
Soybean Silage	258	25.0	1.0	1.7
Tobacco Leaves	850	34.8	3.0	35.4
Tobacco Stems	850	24.6	4.2	24.4
Milk, whole	128	5.8	1.9	1.7
Buttermilk	100	6.5	1.0	1.7
Butter	...	2.0	.5	.25
Fat Cattle	...	25.0	7.0	1.0
Fat Hogs	...	18.0	3.0	1.0
Barnyard Manure	250	5.0	1.5	4.0

To change the wt. of Nitrogen, N, to ammonia, NH_3, multiply by 1.2.
To change the wt. of phosphorus, P, to Phos. acid, P_2O_5, multiply by 2.3.
To change the wt. of potassium, K, to potash, K_2O, multiply by 1.2.
See Chapter 7 for discussion of this table, compiled from Feeds and Feeding.

—From "Soil Fertility and Permanent Agriculture," by Hopkins.

Table 3

This table shows the average amount of plant food contained in 1,000 pounds of common fertilizing materials.

Material	Nitrogen	Phosphorus		Potassium
		Soluble	Insoluble	
Barnyard manure	5	1.5	...	4
Sodium nitrate	150	....	...	...
Ammonium sulphate	200	....	...	...
Raw bone meal	40	....	90	...
Steamed bone meal	10	....	125	...
Raw phosphate rock	...	....	125	...
Acid phosphate	...	70	10	...
Basic slag	...	....	80	...
Wood ashes	...	5	...	50
Kanit	...	....	...	120
Potassium chloride	...	....	...	400
Potassium sulphate	...	....	...	400

—Compiled from Hopkins' "Soil Fertility and Permanent Agriculture."

Table 4

LIST OF STATE EXPERIMENT STATIONS

(Post-office address in italics. Bulletins are free to residents of a State)

ALABAMA—
College Station: *Auburn*
Canebrake Station: *Uniontown*
ARIZONA—*Tucson*
ARKANSAS—*Fayetteville*
CALIFORNIA—*Berkeley*
COLORADO—*Fort Collins*
CONNECTICUT—
State Station: *New Haven*
Storrs Station: *Storrs*
DELAWARE—*Newark*
FLORIDA—*Gainesville*
GEORGIA—*Experiment*
IDAHO—*Moscow*
ILLINOIS—*Urbana*
INDIANA—*Lafayette*
IOWA—*Ames*
KANSAS—*Manhattan*
KENTUCKY—*Lexington*
LOUISIANA—
State Station: *Baton Rouge*
Sugar Station: *Audubon Park, New Orleans*
North La. Station: *Calhoun*
MAINE—*Orono*
MARYLAND—*College Park*
MASSACHUSETTS—*Amherst*
MICHIGAN—*East Lansing*
MINNESOTA—University Farm: *St. Paul*
MISSISSIPPI—*Agricultural College*
MISSOURI—
College Station: *Columbia*
Fruit Station: *Mountain Grove*
MONTANA—*Bozeman*
NEBRASKA—*Lincoln*
NEVADA—*Reno*
NEW HAMPSHIRE—*Durham*
NEW JERSEY—*New Brunswick*
N. MEXICO—*Agricultural College*
NEW YORK
State Station: *Geneva*
Cornell Station: *Ithaca*
NORTH CAROLINA—
College Station: *West Raleigh*
State Station: *Raleigh*
N. DAKOTA—*Agricultural College*
OHIO—*Wooster*
OKLAHOMA—*Stillwater*
OREGON—*Cornwallis*
PENNSYLVANIA—*State College*
PORTO RICO—*Mayaguez*
RHODE ISLAND—*Kingston*
S. CAROLINA—*Clemson College*
S. DAKOTA—*Brookings*
TENNESSEE—*Knoxville*
TEXAS—*College Station*
UTAH—*Logan*
VERMONT—*Burlington*
VIRGINIA—*Blacksburg*
Truck Station: *Norfolk*
WASHINGTON—*Pullman*
WEST VIRGINIA—*Morgantown*
WISCONSIN—*Madison*
WYOMING—*Laramie*

Send for the list of available bulletins of your State Experiment Station.

Table 5

LEGAL WEIGHT OF VARIOUS COMMODITIES
(Minimum weight, by U. S. Statute)

	Pounds per Bushel		Pounds per Bushel
Apples, dried	26	Lime, unslaked	30
Barley	48	Malt	38
Beans, castor	46	Millet seed	50
Beans, white	60	Oats	32
Bluegrass seed	44	Onions	57
Bran	20	Peas	60
Buckwheat	48	Peas, ground pea meal	42
Clover seed	60	Potatoes, Irish	60
Coal	80	Potatoes, sweet	55
Corn, shelled	56	Rye	56
Corn, in the ear	70	Salt, fine	167
Corn meal	48	Salt, coarse	151
Flaxseed	56	Timothy seed	46
Hemp seed	44	Turnips	55
Hungarian grass seed	50	Wheat	60

Rule for Estimating Hay

Hay is often sold in the mow or stack where the weight has to be estimated. For this purpose 400 cubic feet of hay is considered a ton. The actual weight of 400 cubic feet of hay will vary according to the quality of the hay, time of cutting, position in the mow, etc. For making an estimate in a given case multiply together the length, breadth and height of the mow or stack in feet and divide the product by 400. The quotient will be the number of tons.

Measuring Corn in Bulk

Two cubic feet of sound, dry corn in the ear will make a bushel shelled. To get the quantity of shelled corn in

a crib of corn in the ear, measure the length, breadth and height of the crib, inside of the rail; multiply the length by the breadth, and the product by the height; then divide the product by two, and you have the number of bushels in the crib.

Table 6

WHAT CONCENTRATED FEEDS WEIGH

FEED	Weight of One Quart	Pound Measures
	Pounds	Quarts
Dried beet pulp	.55	1.8
Dried brewers' grains	.6	1.7
Corn and cob meal	1.4	.7
Corn and oat feed	.7	1.4
Corn bran	.5	2.0
Corn meal	1.5	.7
Corn, whole	1.7	.6
Cottonseed meal	1.5	.7
Cotton seed	1.0	1.0
Germ oil meal	1.4	.7
Gluten feed	1.3	.8
Gluten meal	1.7	.6
Hominy meal	1.1	.9
Kafir meal	1.6	.6
Linseed meal (new process)	.9	1.1
Linseed meal (old process)	1.1	.9
Malt sprouts	.6	1.7
Wheat bran	.5	2.0
Wheat, ground	1.7	.6
Wheat middlings (flour)	1.2	.8
Wheat middlings (standard)	1.9	.5
Wheat, whole	.8	1.3

Table 7

APPROXIMATE CAPACITY IN TONS OF CYLINDRICAL SILOS

Depth of Silo—Feet	Inside Diameter of Silo—Feet												
	10	12	14	15	16	18	20	21	22	23	24	25	26
20	26	38	51	59	67	85	105	115	127	138	151	163	177
21	28	40	55	63	72	91	112	123	135	148	161	175	189
22	30	43	59	67	77	97	120	132	145	158	172	187	202
23	32	46	62	72	82	103	128	141	154	169	184	199	216
24	34	49	66	76	87	110	135	149	164	179	195	212	229
25	36	52	70	81	90	116	143	158	173	190	206	224	242
26	38	55	74	85	97	123	152	168	184	201	219	237	257
27	40	58	78	90	103	130	160	177	194	212	231	251	271
28	42	61	83	95	108	137	169	186	204	223	243	264	285
29	45	64	88	100	114	144	178	196	215	235	256	278	300
30	47	68	93	105	119	151	187	206	226	247	269	292	315
31	49	70	96	110	125	158	195	215	236	258	282	305	330
32	51	73	101	115	131	166	205	226	248	271	295	320	346

Table 8

MODIFIED WOLFF-LEHMANN FEEDING STANDARDS FOR FARM ANIMALS

Dairy Cows	Digestible Protein Lbs.	Total Digestible Nutrients Lbs.
1. Dairy Cows:		
For maintenance of 1,000-lb. cow	0.700	7.925
To allow for maintenance add:		
For each lb. of 3.0 per cent. milk	0.047–0.057	0.286
" " " " 3.5 " " "	0.049–0.061	0.316
" " " " 4.0 " " "	0.054–0.065	0.346
" " " " 4.5 " " "	0.057–0.069	0.376
" " " " 5.0 " " "	0.060–0.073	0.402
" " " " 5.5 " " "	0.064–0.077	0.428
" " " " 6.0 " " "	0.067–0.081	0.454

Animals Steers, Horses, Colts, Sheep and Swine	Per Day per 1,000 lbs. Live Weight		
	Dry Matter Lbs.	Digestible Protein Lbs.	Total Digestible Nutrients Lbs.
2. Growing, fattening steers:			
Weight 500 lbs.	23.9	2.1	15.8
" 600 "	23.2	2.0	15.4
" 700 "	22.6	2.0	14.8
" 800 "	21.4	2.0	14.3
" 900 "	20.2	2.0	13.6
" 1,000 "	19.7	1.8	13.5
" 1,100 "	18.1	1.6	12.6
" 1,200 "	17.3	1.5	12.3
3. Horses:			
Idle	13.0–18.0	0.8–1.0	7.0–9.0
At light work	15.0–22.0	1.1–1.4	10.0–13.1
At medium work	16.0–24.0	1.4–1.7	12.8–15.6
At heavy work	18.0–26.0	2.0–2.2	15.9–19.5
4. Growing colts over:			
6 months	18.0–22.0	1.6–1.8	11.0–13.0
5. Fattening Lambs:			
Weight 50– 70 lbs.	27.0–30.0	3.1–3.3	19.0–22.0
" 70– 90 "	28.0–31.0	2.5–2.8	20.0–23.0
" 90–110 "	27.0–31.0	2.3–2.5	19.0–23.0
6. Fattening Pigs:			
Weight 30– 50 lbs.	46.2–51.0	7.8–8.5	41.0–45.4
" 50–100 "	37.0–40.8	5.5–6.0	32.9–36.4
" 100–150 "	32.4–35.8	4.4–4.9	28.8–31.9
" 150–200 "	29.0–32.0	3.5–3.9	25.8–28.5
" 200–250 "	25.5–28.1	3.0–3.4	22.7–25.0
" 250–300 "	22.4–24.8	2.6–2.9	20.0–22.0

Poultry	Per Day per 100 lbs. Live Weight: Digestible Protein Lbs.	Per Day per 100 lbs. Live Weight: Total Digestible Nutrients Lbs.
7. Wheeler Standards for poultry:		
For maintenance—		
Hens of 5 to 7 lbs. weight	0.40	2.85
Hens of 3 to 5 lbs. weight	0.50	4.12
For hens in full laying—		
Hens of 5 to 8 lbs. weight	0.65	3.35
Hens of 3 to 5 lbs. weight	1.00	5.54

—From "Feeds and Feeding Abridged," by Henry & Morrison.

Exercises 8, Sept., 6, Nov., and 7, Nov., explain the use of the above table. To illustrate the calculation for determining from the table, the nutritive ratio of any of the requirements, let us take the requirements for laying hens weighing 3 to 5 lbs.

5.54 — 1.00 = 4.54 lbs. of CH + (Fat x 2.25)
4.54 ÷ 1.00 = 4.54. " nutritive ratio = 1 : 4.54.
(See exercise 5, October).

Table 9

LABORATORY AND SCHOOL SUPPLIES

The following school supply companies and manufacturers have much material pertaining to agriculture for sale. From them may be purchased milk testing outfits, specimens of grains and weed seeds, charts of animals, score cards, litmus paper, chemicals, and in fact most anything needed in the school room. Write for their catalog, stating what kind of material you desire.

Central Scientific Co. ..... Chicago, Ill.
W. M. Welch Scientific Co. ..... Chicago, Ill.
Chicago Apparatus Co. ..... Chicago, Ill.
Industrial Educational Co. ..... Indianapolis, Ind.
The Columbian School Supply Co. ..... Indianapolis, Ind.
The Kauffman-Lattimer Co. ..... Columbus, Ohio.
L. E. Knott Apparatus Co. ..... Boston, Mass.
The Creamery Package Co. ..... Chicago, Ill., and
(Milk testing supplies only) Philadelphia, Pa.
The American Fork and Hoe Co. ..... Cleveland, Ohio.
S. L. Allen & Co. ..... Cleveland, Ohio.
(These two companies handle garden implements.)
The Prang Co. ..... Chicago, Ill., and
(Colored construction paper for agricultural booklets.) New York City
Gaylord Bros. ..... Syracuse, N. Y.
(Index cards, note book covers, bulletin covers, and gummed letters and numbers.)
University of Chicago Press ..... Chicago, Ill.
(Outline maps for note books.)
Modern Mfg. Co. ..... 543 N. Lawrence St.,
(Paper pots and bands.) Philadelphia, Pa.

Table 10

NUMBER OF TREES OR SHRUBS REQUIRED TO SET ONE ACRE

1 x 3 ft. 8 in.	11,880	10 x 12 ft.	363
2 x 3 ft. 8 in.	5,940	12 x 12 ft.	302
2 x 5 ft.	4,356	12 x 16 ft.	226
3 x 3 ft.	4,840	16 x 16 ft.	170
3 x 6 ft.	2,420	18 x 18 ft.	134
3 x 8 ft.	1,815	20 x 20 ft.	108
4 x 4 ft.	2,722	20 x 30 ft.	72
4 x 6 ft.	1,185	24 x 24 ft.	75
5 x 5 ft.	1,742	25 x 25 ft.	69
5 x 8 ft.	1,089	30 x 30 ft.	49
6 x 6 ft.	1,210	32 x 32 ft.	42
6 x 8 ft.	907	34 x 34 ft.	37
8 x 8 ft.	680	36 x 36 ft.	33
8 x 10 ft.	544	38 x 38 ft.	30
10 x 10 ft.	435	40 x 40 ft.	27

To determine the number of trees per acre for any given distance, multiply the distance between the trees in the row by the width of the row. Take the resulting answer and divide 43,560 by it. The resulting figures will give you the number of trees per acre.

For example: To determine the number of trees, planted 30 x 30, required to set one acre: 30 x 30 = 900.

43,560 ÷ 900 = 49 trees per acre.

NUMBER OF PLANTS REQUIRED TO SET ONE ACRE

1 x 1 foot	43,560	2 x 3 feet	7,260
1 x 1 foot 6 inches	29,040	2 x 2 feet 6 inches	8,712
1 x 2 feet	21,780	2 x 3 feet 6 inches	6,223
1 x 3 feet	14,520	2 x 4 feet	5,445
1 x 4 feet	10,890	3 x 3 feet	4,840
2 x 2 feet	10,890	3 x 4 feet	3,630

To determine the number of plants per acre for any given distance, multiply the distance between the plants in the row by the distance the rows are apart. Take the resulting answer and divide 43,560 by it. The resulting figures will give you the number of plants per acre.

For example: To determine the number of plants, planted 2 feet by 4 feet, required to set 1 acre: 2 x 4 = 8; 43,560 ÷ 8 = 5,445.

—From Stark Bros. "More Profitable Fruit Growing."

Table 11

GARDENER'S PLANTING TABLE.

Quantity of seeds or number of plants required for a row 100 feet in length, with distances to plant, times for planting, and period required for production of crop.

Kind of Vegetable	Seeds or Plants Required for 100 Feet of Row	Distance for Plants to Stand— Rows Apart: Horse Cultivation	Distance for Plants to Stand— Rows Apart: Hand Cultivation	Distance for Plants to Stand— Plants Apart in Rows	Depth of Planting	Ready for Use after Planting
Asparagus, plants	60 to 80 plants	3 to 5 ft.	18 to 24 in.	15 to 20 in.	3 to 5 in.	1 to 3 years.
Beans, bush	1 pint	30 to 36 in.	18 to 24 in.	5 or 8 to ft.	½ to 2 in.	40 to 65 days.
Beans, pole	½ pint	3 to 4 ft.	3 to 4 ft.	3 to 4 ft.	1 to 2 in.	50 to 80 days.
Beets	2 ounces	24 to 36 in.	18 to 24 in.	5 or 6 to ft.	1 to 2 in.	60 to 80 days.
Brussels sprouts	¼ ounce	30 to 36 in.	24 to 30 in.	16 to 24 in.	½ in.	90 to 120 days.
Cabbage, early	¼ ounce	30 to 36 in.	24 to 30 in.	12 to 18 in.	½ in.	90 to 130 days.
Cabbage, late	¼ ounce	30 to 40 in.	24 to 36 in.	16 to 24 in.	½ in.	90 to 130 days.
Carrot	1 ounce	30 to 36 in.	18 to 24 in.	6 or 7 to ft.	½ in.	75 to 110 days.
Cauliflower	¼ ounce	30 to 36 in.	24 to 30 in.	14 to 18 in.	½ in.	100 to 130 days.
Celeriac	¼ ounce	30 to 36 in.	18 to 24 in.	4 or 5 to ft.	⅛ in.	100 to 150 days.
Celery	¼ ounce	3 to 6 ft.	18 to 36 in.	4 to 8 in.	⅛ in.	120 to 150 days.
Corn, sweet	¼ pint	36 to 42 in.	30 to 36 in.	30 to 36 in.	1 to 2 in.	60 to 100 days.
Cress, upland	½ ounce	30 in.	18 to 24 in.	4 or 5 to ft.	½ to 1 in.	30 to 40 days.
Cucumber	½ ounce	4 to 6 ft.	4 to 6 ft.	4 to 6 ft.	1 to 2 in.	60 to 80 days.
Eggplant	½ ounce	30 to 36 in.	24 to 30 in.	18 to 24 in.	½ to 1 in.	100 to 140 days.
Endive	1 ounce	30 in.	18 in.	8 to 12 in.	½ to 1 in.	90 to 180 days.
Horse-radish	70 roots	30 to 40 in.	24 to 30 in.	14 to 20 in.	3 to 4 in.	1 to 2 years.
Kale, or borecole	¼ ounce	30 to 36 in.	18 to 24 in.	18 to 24 in.	½ in.	90 to 120 days.
Kohlrabi	¼ ounce	30 to 36 in.	18 to 24 in.	4 to 8 in.	½ in.	60 to 80 days.
Leek	½ ounce	30 to 36 in.	14 to 20 in.	4 to 8 in.	1 in.	120 to 180 days.
Lettuce	½ ounce	30 in.	18 to 24 in.	4 to 6 in.	½ in.	60 to 90 days.
Melon, muskmelon	½ ounce	6 to 8 ft.	6 to 8 ft.	Hills 6 ft.	1 to 2 in.	120 to 150 days.
Melon, watermelon	1 ounce	8 to 12 ft.	8 to 12 ft.	Hills 10 ft.	1 to 2 in.	100 to 120 days.
Mustard	¼ ounce	30 to 36 in.	18 to 24 in.	4 or 5 to ft.	¼ in.	60 to 90 days.
New Zealand spinach	1 ounce	36 in.	24 to 36 in.	12 to 18 in.	1 to 2 in.	60 to 100 days.

Okra, or gumbo	2 ounces	4 to 5 ft.	3 to 4 ft.	24 to 30 in.	1 to 2 in.	90 to 140 days.
Onion, seed	1 ounce	24 to 36 in.	18 to 24 in.	4 or 5 to ft.	½ to 1 in.	130 to 150 days.
Onion, sets	1 quart of sets	24 to 36 in.	18 to 24 in.	4 or 5 to ft.	1 to 2 in.	90 to 120 days.
Parsley	¼ ounce	24 to 36 in.	18 to 24 in.	3 to 6 in.	⅛ in.	90 to 120 days.
Parsnip	½ ounce	30 to 36 in.	18 to 24 in.	5 or 6 to ft.	½ to 1 in.	125 to 160 days.
Peas	1 to 2 pints	3 to 4 ft.	30 to 36 in.	15 to ft.	2 to 3 in.	40 to 80 days.
Pepper	⅛ ounce	30 to 36 in.	18 to 24 in.	15 to 18 in.	½ in.	100 to 140 days.
Potato, Irish	5 lbs. (or 9 bu. per acre)	30 to 36 in.	24 to 36 in.	14 to 18 in.	4 in.	80 to 140 days.
Potato, sweet	3 lbs. (or 75 slips)	3 to 5 ft.	3 to 5 ft.	14 in.	3 in.	140 to 160 days.
Pumpkin	½ ounce	8 to 12 ft.	8 to 12 ft.	Hills 8 to 12 ft.	1 to 2 in.	100 to 140 days.
Radish	1 ounce	24 to 36 in.	18 to 24 in.	8 to 12 to ft.	½ to 1 in.	20 to 40 days.
Rhubarb, seed	½ ounce	36 in.	30 to 36 in.	6 to 8 in.	½ to 1 in.	2 to 4 years.
Rhubarb, plants	33 plants	3 to 5 ft.	3 to 5 ft.	3 ft.	2 to 3 in.	1 to 3 years.
Rutabaga	¼ ounce	30 to 36 in.	18 to 24 in.	6 to 8 in.	½ to 1 in.	60 to 80 days.
Salsify	1 ounce	30 to 36 in.	18 to 24 in.	2 to 4 in.	½ to 1 in.	120 to 180 days.
Spinach	1 ounce	30 to 36 in.	18 to 24 in.	7 or 8 to ft.	1 to 2 in.	30 to 60 days.
Squash, bush	½ ounce	3 to 4 ft.	3 to 4 ft.	Hills 3 to 4 ft.	1 to 2 in.	60 to 80 days.
Squash, late	½ ounce	7 to 10 ft.	7 to 10 ft.	Hills 7 to 9 ft.	1 to 2 in.	120 to 160 days.
Tomato	1 ounce	3 to 5 ft.	3 to 4 ft.	3 ft.	½ to 1 in.	100 to 140 days.
Turnip	½ ounce	24 to 36 in.	18 to 24 in.	6 or 7 to ft.	¼ to ½ in.	60 to 80 days.
Vegetable marrow	½ ounce	8 to 12 ft.	8 to 12 ft.	Hills 8 to 9 ft.	1 to 2 in.	110 to 140 days.

Table 12

SCORE CARD FOR COMMERCIAL EGGS

SCALE OF POINTS	Perfect Score	Student's Score	Corrected Score	REMARKS
1. Weight	20			
2. Uniformity of Size	10			
3. Shape	10			
4. Strength and Smoothness of Shell	10			
5. Condition of Shell	10			
6. Uniformity of Color	10			
7. Quality (a) Fullness (Small Air Cell)	15			
(b) Clearness	15			
Total	100			

DISQUALIFICATIONS

Double yolk, cracked and extremely dirty shells, extremely shrunken, spotted or loose contents in any one egg of the dozen.

1. WEIGHT

24 to 28 ounces per dozen. Cut two points for each ounce over or

2. UNIFORMITY OF SIZE

All eggs should be of the same size.

3. SHAPE

Should be typical egg shape, free from ridges, and should be uniformly the same for the entire dozen.

4. STRENGTH AND SMOOTHNESS OF SHELL

Shell should be free from wrinkles, cracks and rough places.

5. CONDITION OF SHELL

Free from dirt or stain, and free from gloss, showing that the egg is fresh and unwashed.

6. UNIFORMITY OF COLOR

If white, the eggs should be all pure white and of the same shade; if brown, the color may be any shade, but should be uniformly the same for the entire dozen.

7. QUALITY

Test with candler. A very small air cell not larger than a dime indicates freshness. The egg must appear clear and free from dark-colored spots, the white thick, the yolk barely visible. Large air cells or floating yolks are disqualifications.

Entry No. .....Weight.....

Breed of Fowls.....Class (Brown or White).....

Student's Name .....

Date ..... Standing.....%

Table 13

SCORE CARD FOR VEGETABLES.

Vegetable..... Variety.....

Class..... Exhibit No.....

Points	Perfect	Scorer's	Corrected
Uniformity.....	20	.....	.....
Symmetry.....	15	.....	.....
Quality.....	15	.....	.....
Texture.....	10	.....	.....
Freedom from blemishes.....	15	.....	.....
Commercial or table value.....	25	.....	.....
Total.....	100	.....	.....

Remarks.....

Name of scorer.....Date.....

SCORE CARD FOR APPLES—PLATE.

OR OTHER FRUITS.

Variety..... Exhibit No.....

Point	Perfect	Scorer's	Corrected
Size (Normal: Neither too large nor too small)	10	.....	.....
Color, typical.....	25	.....	.....
Freedom from blemish.....	20	.....	.....
Texture and flavor.....	20	.....	.....
Uniformity and trueness to type.....	25	.....	.....
Total.....	100	.....	.....

Remarks.....

Name of scorer..... Date.....

SCORE CARD FOR CANNED FRUIT OR VEGETABLES.

Kind..... Variety..... Exhibit No.....

Points	Perfect	Scorer's	Corrected
Flavor: The flavor should be agreeable and as nearly as possible that of the fresh, perfect fruit or vegetable.....	45	.....	.....
Texture: Well cooked—so that it is tender, yet not overcooked.....	25	.....	.....
Condition: Liquid clear. No sign of decomposition. Product should be uniform in size, well arranged in can, and of good color.....	10	.....	.....
Purity: Free from foreign material, preservatives, or artificial color.....	10	.....	.....
Package: Cans should be uniform and of quality, shape, and size practicable to the average home. The labels should be suitable, uniform, and neat.....	10	.....	.....
Total.....	100	.....	.....

Remarks.....

Name of scorer..... Date.....

—From Bul. 281—U. S. Department of Agriculture.

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