BULLETIN
OF THE
STATE BOARD FOR VOCATIONAL EDUCATION
In Co-operation with the Federal Board for Vocational Education

LABORATORY EXERCISES IN PLANT PRODUCTION

ANNIE WEBB BLANTON
State Superintendent and Executive Officer
State Board for Vocational Education

J. D. BLACKWELL
State Director of Agricultural Education

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BULLETIN 107 SEPTEMBER 1, 1919

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THE DEPARTMENT OF EDUCATION
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INTRODUCTION

This bulletin, containing seventy-six exercises in Plant Production, is to be used as a supplement to Bulletin 93, "A Year's Work in Plant Production." It has been prepared largely by the class in agronomy at the Agricultural and Mechanical College, which class has been under the immediate direction of Professor C. A. Wood during the past summer. The class consisted of forty-five prospective teachers of vocational agriculture, many of whom have had some experience teaching vocational agriculture. It is therefore expected that this bulletin will be very helpful to teachers of the subject.

In order to obtain the one and one-half units of credit that is granted by the Committee on Affiliation upon the completion of a year's work in Vocational Agriculture, it is recommended that a minimum of seventy-five exercises be completed and recorded in a note-book. Six of these books and six sets of examination papers must be sent to the Department of Education on or before June first of each school year.

The following suggestions in regard to note-books should be kept in mind:

1. Note-books should teach accuracy, neatness, and promptness.
2. They should be graded and returned to the pupil each week.
3. The entire exercise should be read and references looked up before an attempt is made to perform the exercise.
4. Each exercise should be recorded according to the form suggested in Bulletin 93.

LIST OF REQUIRED EQUIPMENT FOR PLANT PRODUCTION

	Approximate Price
Soil Auger	$ 4.25
Set Soil Sieves	9.00
Soil Thermometer	2.50
Capillarity Tubes, 2x8 inch (12)	1.30
Support for Capillarity Tubes	1.35
Tube Brush	.50
Trip Scale	12.00
Set Weights, 5 to 1000g iron	3.00
Alcohol Lamps, 8 oz. (4)	1.44
Alcohol Stove Lamp	1.00
Retort Stand with three rings	1.40
Test Tubes, 3x$\frac{3}{8}$ inch (12)	.20
Test Tubes, 5x$\frac{5}{8}$ inch (12)	26
Thermometer, 10 to 110 c.c. (12 inch)	1.25
Graduate Cylinder, 100 c.c	.80
Mortar and Pestle, 100 mm	.65
Test Tube Rack	.60
Package Filter Paper, 12.5 cm	.25
Glass Funnels, 3$\frac{1}{2}$ inch (2)	.80
Nest of Beakers Nos. 0000-00	.43
Nest of Beakers Nos. 0-3	.77
Funnel Support	1.10
Evaporating Dishes, No. 000 (6)	.96
Pair Crucible Tongs, 9 inch	.22
Wire Gauze, 12x12 inch	.30
Rulers (6)	.30
Flower Pots, 4 inch (12)	.20
Bucket Sprayer	8.00
Riker Specimen Mounts, 5x6 inch (6)	1.50
Tripod Magnifiers (4)	4.80
Tape Measure, 50 feet	1.30
Mount of Common Farm Seeds	2.00
Mount of Common Farm Seeds	2.00
Tablets Score Cards, Corn (4)	.72
Tablets Score Cards, Oats (4)	.78
Balopticon	40.00
Camera, buy locally.	
Farm Level	20.00
Total	$125.33

LABORATORY EXERCISES IN PLANT PRODUCTION

EXERCISE 1 — COLLECTION AND IDENTIFICATION OF SEED

Object: To collect and identify seed.

Material: Small bottles, note-book, pencil.

Directions: Visit several farms or places where crops are growing and collect several kinds of seed. If seeds are found that cannot be readily identified take them to the laboratory and try to identify them. Place each sample in a small bottle and label. Collect and identify at least twenty-five kinds of seed. If a lens is available make drawings of each kind of seed, and tabulate the data as follows:

Data:

No. of bottle	Name of seed	Drawing of seed

EXERCISE 2 — STUDY OF SEED

Object: To study the parts and composition of seed.

Material: Beans, corn, cotton seed, nitric acid, and iodine solution. S. D. Ed. 92, Ex. 2.

Directions: Soak a few beans and corn in warm water for an hour. Examine the bean carefully for the hilum or scar. Sever the seed into two parts. These parts are the cotyledons. Upon germination of the seed, these two parts become the seed leaves. Between the two parts will be found a small bud, which is the embryo or germ. When the seed germinates, this germ produces two parts, the radicle or primary root and the plumule or primary stem. The harder portion of the seed is the endosperm and the outside layer, the seed coat. Study the corn kernel the same way and make drawings of longitudinal and cross sections of each. Label all parts.

To determine the composition of the various seed, place a drop of nitric acid on a cross section of a seed. An orange color produced will indicate protein. Place a drop of iodine solution on another cross section. A deep blue color will indicate the presence of starch. Scrape off a small portion of the seed and heat it over a flame. Place this heated portion of the seed on a paper. If a grease spot is produced, the presence of fats is indicated.

Data:

Name of seed	Protein	Starch	Fat

Conclusions.

EXERCISE 3 STUDY OF ROOT SYSTEMS

Object: To better understand root systems of plants.

Material: Several different kinds of plants (corn, cotton, peanuts, clover, grass).

Directions: Examine carefully and make drawings of the root systems of each of the different plants obtained. Observe the characters of the main lateral and root hairs found. Look for nodules on roots of legumes. Do any of the roots studied aid directly in propagating the plants? Cut small cross section of the roots, and make drawings of them with the aid of a hand lens, or compound microscope, if one is available.

Data:

Name of plant	Character of roots

Conclusions.

EXERCISE 4 DEMONSTRATION OF OSMOSIS

Object: To illustrate the principle of osmosis as related to plant feeding.

Material: Parchment paper or animal membrane (pig bladder), strong salt solution, bottle, thistle tube and stopper.

Directions: Tie a piece of parchment paper over the large end of a thistle tube and fill the tube with a strong solution of salt water. Place the tube in a bottle of water, holding it in place with the stopper in such a way that the top of the solution is at the same height as the water in the bottle. After allowing it to stand for some time, note that the water in the tube has risen above the height of the water in the bottle. This shows that the less dense solution has passed through the membrane into the more dense solution.

Data: See S. D. Ed., Ex. 5.

Conclusions.

EXERCISE 5 STUDY OF STEM STRUCTURE

Object: To understand stem structure.

Material: Cross sections of corn stem, cross section of twig, hand lens, knife.

Directions: Study a longitudinal and cross section of a corn stem, and of a twig. Place the cross sections under the lens and study the fibro-vascular bundles through which the food passes. Make drawings of the sections and label the various parts.

EXERCISE 6 STUDY OF THE FLOWER PARTS

Object: To better understand the parts of a flower.

Material: A medium sized complete flower.

Directions: Make a drawing of the entire flower. Be careful to show the parts as they appear. Now cut the flower lengthwise, and make a drawing showing the parts. Label all the parts and write a brief description of each part and give its function.

Discuss briefly the different methods of pollination.

EXERCISE 7 CLASSIFICATION OF FRUITS

Object: To classify different kinds of fruits.

Material: Different kinds of fruits, such as peaches, pears, grapes, blackberries, etc.

Directions: Collect and number the different kinds of fruit. Take each fruit and classify the plant from which it came into shrub, tree, vine or herb. Study also the internal structure of the fruit, observing the character, sweetness, and the formation of seed.

Data:

Name	Tree	Vine	Shrub	Herb	Sweet	Sour	Seed

Conclusions.

Reference: "Waugh." "Pomology." Fruit Classification.

EXERCISE 8

EXCESSIVE AND INSUFFICIENT AMOUNTS OF WATER FOR PLANTS

Object: To study the effect of different amounts of water on plants.

Material: Three flower pots with a growing plant in each (tomato, geranium, corn, etc.).

Directions: Number the pots 1, 2 and 3. Apply to number 1 an excessive amount of moisture. To number 2 a normal amount, and to number 3 a very small amount (just enough to keep it alive). Let these stand under the same atmospheric conditions for several days. Note the condition of plant growth daily.

Data:

Pot No.	Amount moisture applied	No days	Effect

Conclusions.

EXERCISE 9 THE EFFECT OF SUNLIGHT ON FOLIAGE

Object: To study the effect of sunlight on the foliage of plants.

Material: A growing plant, two pieces of cork, black paper or felt.

Directions: Cut a round hole in each of two corks and pin them, one on each side of a leaf, in such a way that the hole in one of the corks will be directly opposite the hole in the other. Pin them together tightly so that the light will be cut off of a portion of the leaf. The portion of the leaf under the hole in the cork will be exposed. Set the plant where it will grow well for several days, then remove the corks. The leaf will show green where the surface was exposed. The covered portion of the leaf will be almost white.

Make drawings.

Data:

Plant used	Days exposed	Result

Conclusions.

EXERCISE 10 EFFECT OF DIFFERENT FERTILIZERS ON PLANT GROWTH

Object: To show the effect of different fertilizers on plant growth.

Material: Sixteen small plots of ground about one by two rods in size and a few pounds of each of the following fertilizing material: nitrate of soda, acid phosphate, kainit, and lime.

Directions: Measure off sixteen small plots of ground. To plots Nos. 1 and 2 apply nitrate of soda at the rate of one hundred and fifty pounds per acre; to plots Nos. 3 and 4, apply acid phosphate at the rate of one hundred and fifty pounds per acre; to plots Nos. 5 and 6, apply kainit at the rate of one hundred and fifty pounds per acre; to plots Nos. 7 and 8, apply nitrate of soda and acid phosphate mixed, at the rate of one hundred and fifty pounds per acre; to plots Nos. 9 and 10, apply sodium nitrate and kainit mixed, at the rate of one hundred and fifty pounds per acre; to plots Nos. 11 and 12, apply kainit and acid phosphate mixed, at the rate of one hundred and fifty pounds per acre; to plots Nos. 13 and 14, apply sodium nitrate, acid phosphate and kainit mixed, at the rate of one hundred and fifty pounds per acre; to plots Nos. 15 and 16, apply lime at the rate of six hundred pounds per acre. Prepare the ground well, weigh out the required amounts of fertilizer, apply broadcast and harrow it in. Plant and cultivate all the plots alike. (Each single operation should be completed the day it is started.) Make observations each week during the growing season.

Data:

Date	No. of plot	Fertilizer used	Amount fertilizer	Condition of growth

EXERCISE 11 PREPARATION OF BORDEAUX MIXTURE

Object: To prepare a fungicide.

Material: 1 pound copper sulphate, 1 pound unslacked lime, 10 gallons of water.

Directions: Dissolve the copper sulphate, and slack the lime separately. Add equal parts of water to each, then mix thoroughly. Keep in large bottles and use as needed in spraying garden for fungus diseases.

Data:

Amount of copper sulphate	Amount unslacked lime	Amount water	Date

EXERCISE 12 PREPARATION OF KEROSENE EMULSION

Object: To prepare a contact insecticide.

Material: 2 gallons kerosene, $\frac{1}{2}$ pound soap, 16 gallons water.

Directions: After slicing soap very thin, dissolve in one gallon hot water, add the kerosene, and stir until a creamy emulsion is formed. Dilute with 15 gallons of water and spray vines, etc., for insects.

Data:

Amount of kerosene	Amount of soap	Amount hot water	Date

EXERCISE 13 STUDY OF COMMON WEEDS

Object: To study the characteristics of common weeds.

Material: Large sheets of rather stiff white paper, some newspapers, a press, and paste.

Directions: Collect ten different common weeds. Bring them to the laboratory and press them between newspapers under a press. When the plants are cured mount them on the large sheets of paper. Label each mount as follows:

Name of weed.
Class (Annual, etc.)
Dissemination of seed
Habitat
Date
Collector's name

EXERCISE 14 CONSTRUCTION OF HOT BEDS AND COLD FRAMES

Object: To learn how to construct and manage hot beds and cold frames.

Material: Lumber, horse manure, tools, nails, thermometer, and window sashes, or cloth.

Directions: Select some well drained spot with a southern slope, and dig a pit two feet deep and as long and as wide as the window sashes you are going to use will cover. Build a frame out of lumber to hold the window sashes. Fill the pit with fresh horse manure which contains a large amount of straw. Keep moist and it will soon heat up. Pack well in the pit, and cover with about six inches of good mellow soil. When the temperature recedes to about 90 degrees the bed is ready to plant. Protect the plants with the sashes during cold weather. They may be removed during the day when the weather is warm. Watch the watering, ventilation and cultivating carefully.

COLD FRAMES

A cold frame is made in the same way as a hot bed, except the pit and manure are omitted.

EXERCISE 15 CONSTRUCTION OF A GREENHOUSE

Object: To learn to construct a greenhouse.

Material: Hand saw, hammer, square, level, nails, eighteen window sash 3x4 feet, and the following lumber: two plates 2x4 inches sixteen feet long; two sills, 4x6 inches sixteen feet long; two 4x6 inch pieces twelve feet long; fourteen posts, 4x4 inches, eight feet long; ten rafters, five, 2x4 inches, twelve feet long; five, 2-4 inch pieces four feet long; eighteen pieces of siding 1x8 inches, sixteen feet long, and eighteen pieces siding, 1x8 inches, twelve feet long.

Directions: Select a suitable place and plan your house to be sixteen feet long and twelve feet wide. Place your long sill east and west. Erect a post at each corner and two at either end with three at each side between the corners. Place the rafters and plates on the top of the posts lengthwise. Prepare the long rafters for the long slope and the short ones for the short slope. Have the long slope face the south. It will take fourteen window sash to cover the long slope and four to cover the short slope. Have three of these sash hung with hinges at the upper end to give the necessary ventilation. Build up the sides to the top of the posts with shiplap. Build the benches about three feet high and as wide as desirable. Place the heater in the east end of the house and cut an opening about eighteen inches square opposite the stove. This will give the necessary ventilation. Estimate cost of building.

Note.—Unless a greenhouse is to be built at the school it will probably be best to use this exercise as a field trip. Take the class to a commercial or private greenhouse. A study of greenhouse con-

struction may be made from this, and available literature on greenhouses.

EXERCISE 16 PROPAGATION BY CUTTINGS

Object: To show how plants are propagated by cuttings.

Material: Twigs of several plants (grape, willow, geranium, fig, etc.). A starting box or a hothouse bed filled with sand.

Directions: Fill the starting box with sand and moisten it well with water. Prepare the cuttings as shown in the text. After the cuttings are prepared make a small hole in the sand with a sharp stick and place the lower end of the cutting in the hole deep enough so that only one bud will be above the sand. Keep the sand moist and warm. When the roots are well started transfer the plants to pots or to the field.

Prepare several cuttings of different plants.

Data:

Kind of plants	Date made	No. made	Date growth starts	Number of successful cuttings

EXERCISE 17 BUDDING

Object: To learn to bud.

Material: Buds of some known plant, some grafting wax, soft string and a good sharp knife.

Directions: To do budding take a bud of known variety and cut it as shown in the references. Place the bud in a stock in which a cut of a T shape has been made. Roll back the bark each side of the longitudinal cut of the T and insert the bud. Be sure that the cambium layer of the bud is in contact with that of the stock. Tie the bud in place carefully with the waxed string.

Note.—It is best to perform this exercise in the field. Require the students to watch the growth of the buds that have been inserted.

Data:

No. buds	No. successful

Conclusions.

EXERCISE 18 TONGUE GRAFTING

Object: To propagate an apple tree by the tongue grafting method.

Material: Apple trees, knife, twine, waxed cloth.

Directions: Select a branch 1 to 1½ inches in diameter and saw off

squarely. Care should be taken that the bark is not loosened from any portion of the stub. Split the stock through the center with a jack knife. Spread the cleft and insert the scion. The scion should come from the previous season's growth of the tree to be propagated and should be long enough to have two or three buds. The lower end of the scion should be cut wedge shape with the outer edge thicker than the inner edge. On inserting the scion be sure that the cambium on the thick side of the wedge is in close contact with the exposed cut surfaces.

Data:

Date of grafting	Kind of trees	No. of grafts made	Result

EXERCISE 19 PREPARATION OF WAXED CLOTH OR STRING

Object: To prepare cloth and string for grafting purposes

Material: Four parts resin, two parts beeswax, one part tallow (by weight), one ball No. 18 knitting cotton, old sheeting.

Directions: In order to make grafting wax, the resin and beeswax should be finely broken up and melted together with the tallow. When thoroughly melted, drop a ball of No. 18 knitting cotton into it and leave for five minutes which is sufficient time to thoroughly saturate the entire ball. In order to make waxed cloth, tear an old sheet into narrow strips, and drop into the melted wax. By punching holes in this waxed cloth it may be used in budding.

Data:

Date	Parts resin	Parts beeswax	Parts tallow	Balls twine

EXERCISE 20 PRUNING DEMONSTRATION

Object: To study pruning of trees.

Material: A pruning saw, knife, and shears.

Directions: Demonstrate the removal of small and large branches. Show how the wounds thus caused may be healed. Call the attention of the students to the principles taught in the text in regard to pruning. After this has been done, the student should prune one or more trees under the direction of the teacher. After several months go back with the students and note the effects of pruning on the growth of the trees.

EXERCISE 21 COLLECTING SOIL SAMPLES

Object: To collect samples of soil.

Material: Soil auger, shovel, small jars.

Directions: With a soil auger bore to the depth of eight inches. Place all soil removed from the hole in one jar. With the shovel clean out the hole so that when boring is continued no soil will fall into the hole. Continue the boring for another eight inches and place all the soil removed in another jar. Repeat this operation four times, each time trying to get a soil of a different type or structure. Label each jar carefully and take them to the laboratory. Compare each of the samples and tabulate your results. Keep soil for future use.

Data:

No. samples	Depth taken	Kind

EXERCISE 22 MECHANICAL ANALYSIS OF SOIL

Object: To make a mechanical analysis of soil.

Material: Sample of soil, large open mouth bottle, cork, soft water and ammonia.

Directions: Put about twenty grams of soil in the bottle. Add about ten drops of ammonia and fill the bottle about two-thirds full of water. Cork tightly and shake vigorously for ten minutes or until all of the granules have been broken down. Allow the bottle to stand for ten minutes. The coarser particles will settle first, the next finer next, and lastly, the clay.

After the bottle has stood for a few minutes, take a drop of water from the bottle with a glass rod and place on a slide. Examine this slide under a microscope. The soil on the slide is clay. Make a drawing showing some of the particles.

If the soil has not been burned the organic matter will float on the top.

Data:

No. grams soil	No. drops ammonia	Per cent sand	Per cent silt	Per cent clay

EXERCISE 23 MOISTURE CONTENT OF SOIL

Object: To determine the amount of moisture in soil on which different kinds of crops are growing.

Material: Samples of soils from fields on which different kinds of crops are growing, balances, evaporating dishes, oven and a dessicator.

Directions: Have as many evaporating dishes as you have samples of soil. Number and weigh each dish. Place a weighed amount of soil in each dish, numbering the dishes the same as the original soil. Let these samples stand in the laboratory for a few days so as to dry out the capillary moisture. When the capillary moisture has been dried out, place the samples in the oven for several hours at a temperature of 100 degrees. Set the dishes in a dessicator and allow them to cool. Weigh and determine the loss of moisture in grams. Also in percentage of dry weight. Make at least two determinations of each sample to prove your work.

Consider an acre foot to weigh 3,500,000 pounds. Calculate the amount of water in pounds found in each sample.

Data:

Dish No.	Amount soil	Total weight	Wt. dry soil	Capillary moisture	Constant weight	Loss in gms.	Per-centage

EXERCISE 24 STUDY OF SOIL TEXTURE

Object: To study and compare soil particles of various kinds of soil.

Material: Samples of several kinds of soil, hand lens. and four test tubes.

Directions: Place the different samples of soil in cans and examine them carefully, noting the color, size, shape of the particles, and how they feel when rubbed together in the hand. Place some of each under a hand lens and make the same observations. Record the results in an outline form.

Put a small amount of each soil in a test tube. Fill the tube about two-thirds full of water and shake thoroughly. Set aside and observe the rapidity with which the particles settle in each tube.

Data:

Color				Shape		Size		
Per cent of particles				Per cent of particles		Per cent of particles		
White	Gray	Brown	Black	Angular	Rounded	Coarse	medium	Fine

EXERCISE 25 EFFECT OF LIME ON SOIL

Object: To determine the effect of lime on soil.

Material: Slacked lime, balances, bucket, clay soil and gravel.

Directions: Weigh out five 200-gram samples of clay. To sample No. 1, add no lime; to sample No. 2, one gram of lime; to sample No. 3, five grams of lime; to sample No. 4, ten grams of lime, and to sample No. 5, twenty grams of lime. Mix each sample with just enough water to make it plastic. Mold into sticks about three-fourths of an inch in diameter and allow to dry for several days in the air. It is best to dry them in a room where the sun cannot strike them else they will break in drying. After they are dry, determine the amount of weight required to break them by placing them in such a way that the ends will rest on something solid, when a weight is hung on the middle. Apply pressure to the center of the sticks by hanging a bucket on the center and slowly filling it with gravel. Determine the amount of weight necessary to break each stick.

Data:

Sample No.	Amount of lime added	Weight required to break

EXERCISE 26 PHYSICAL STUDY OF COMMERCIAL FERTILIZERS

Object: To be able to recognize different commercial fertilizing materials.

Material: Hand lens and several samples of fertilizing material.

Directions: Examine the materials and be able to tell them apart. Place some of each under a microscope and write out a description of the physical characteristics of each. Make such drawings as will enable you to identify each of the materials.

Data:

Fertilizer examined	Physical characteristics

Note.—This could be made an exercise on the mixing of fertilizers if the teacher sees fit to conduct such.

EXERCISE 27 STUDY OF FERTILIZER TAGS

Object: To better understand fertilizer tags.

Material: Obtain fertilizer tags from commercial fertilizer dealers.

Directions: Study each fertilizer tag and note the amount of each fertilizer ingredient available. Often there are other statements made

on the tags that are misleading. Do such statements exist on the tags that you are studying? If you have any such, make out an outline for a new tag that will not be misleading.

Data: Reproduce a typical tag.

Conclusions.

EXERCISE 28 STUDY OF CAPILLARY MOISTURE IN SOIL

Object: To study the rise of capillary water in soil.

Material: Five glass tubes about three feet long, five different classes of soil (sand, fine sand, a course sandy loam, a fine sandy loam, and a clay soil), some pieces of cloth, small pans and a stand in which the tubes will stand upright.

Directions: Fill each tube with soil that has been passed through a fine sieve. One end of the tubes should be covered with a piece of cloth to keep the soil from running out. Place the tubes in the stand in an upright position with one end in the small pans. Put water in the pans and note the rise of water in the soil. Keep a record of the rise of water every ten minutes for the first hour and then every day for a week. Record your results in the following form:

Data:

Tube No.	Content	Rise in inches												
		5′	15′	25′	35′	45′	55′	1 da	2 da	3 da	4 da	5 da	6 da	7 da

EXERCISE 29 PLANNING A CROP ROTATION

Object: To study crop rotation.

Material: Plots of ground and the seed to be used in rotation.

Directions: Each plot should be planted in one of the following crops: corn, cotton, oats. The next year the plot planted in corn the first year should be planted to oats and the one in cotton to corn. The third year the one planted to corn the first year should be planted in cotton. At the end of three years the results of the rotation will begin to show up. After a few years this, if properly carried out, will be a good demonstration for the community.

Data:

Plot No.	Plantings		
	First year	Second year	Third year
1			
2			
3			

Conclusions.

EXERCISE 30 STUDY OF TILLAGE MACHINERY

Object: To better understand tillage machinery.

Material: A representative collection of tillage machinery.

Directions: Visit an implement dealer, or if one is not available, visit some farm that is well stocked with good machinery. Study the types of plows, cultivators, discs and harrows. Study each of the types as to (a) construction, (b) use, and (c) advantage over other types. It will be well to study these under operation, if possible.

Data:

Implement studied	Condition	Use	Advantages

EXERCISE 31 DETERMINATION OF THE WEIGHT OF THE SOIL

Object: To determine the weight of different classes of soil.

Material: A 100 c.c. graduate cylinder, 100 grams of dry soil of each of the classes to be used, and a balance.

Directions: Fill the graduate cylinder with dry soil to the 100 c.c. mark and weigh. Determine the weight of dry soil in the cylinder. Empty the soil and fill the graduate to 100 c.c. mark with water. Determine the weight of the water. Divide the weight of the 100 c.c. of soil by the weight of the 100 c.c. of water. This will give the weight of one c.c. of soil. This is the apparent specific gravity of the soil. The apparent specific gravity of the soil multiplied by the weight of a cubic foot of water will give the weight of a cubic foot of soil. The weight of a cubic foot of soil multiplied by the number of feet in an acre (43,560) will give the weight of an acre of soil one foot deep.

Data:

Wt. graduate cylinder	Wt. 100 c.c. dry soil	Wt. 100 c.c. water	Apparent specific gravity of soil

EXERCISE 32 STUDY OF MULCHES

Object: To show the effect of mulches on soil.

Material: Four flower pots, soil, water, sand, and sawdust.

Directions: Fill each of the flower pots about two-thirds full of soil and set the pots in water. When the soil becomes moist on the top, remove from the water and allow them to drain; weigh and record. Use pot No. 1 as a check. In pot No. 2 place an inch of soil mulch; weigh. In pot No. 3 an inch of sand mulch; weigh. In pot No. 4 an inch of sawdust. Weigh each of the pots at the

expiration of three, five and ten days and compare the ability of the different mulches to hold moisture.

Data:

Pot No.	Content	1st wt.	After 3 days	After 5 days	After 10 days

Conclusions.

EXERCISE 33 TEMPERATURE OF SOILS

Object: To determine the effect of color on the temperature of soil.

Material: Select a smooth, level plot of ground. Cover one portion with coal dust, one with lime, and leave one without a treatment. When the sun shines warm take readings with a thermometer at the depth of one, two, and four inches. Do this on all three plots and record your results.

Data:

Plot No.	Treatment	Temperature at depth of		
		1 inch	2 inches	4 inches

EXERCISE 34 TESTING FOR ACIDITY AND ALKALINITY OF SOIL

Object: To test soils for acid and alkali.

Material: Samples of soil, red and blue litmus paper, distilled water, two clean dishes.

Directions: Place about a handful of soil in a clean dish and moisten it with distilled water. Separate into two parts and work with the hands into a ball. Break these two balls in two and place a piece of blue litmus in one and a piece of red in the other. Allow these papers to remain in the balls of soil for about twenty minutes. Remove the papers. If the blue litmus paper has turned red the soil is acid. If the red litmus has turned blue the soil is alkali. If only partial changes have taken place, the acidity or alkalinity is very slight.

Data:

Ball No.	Paper Used	Result

Conclusions.

EXERCISE 35 STUDY OF SOIL FORMATION, FIELD TRIP

Object: To study the formation of soils.

Material: Hand lens and a soil auger.

Directions: Take the students to some rocky, hilly section through which a creek passes. Study the rock formation, layers of rock, composition (with the lens), effect of water on the rocks, effect of heat and cold and plant roots. Observe the plant growth on the surface of the rocks and on the surface of the soil above the rocks. Write a brief report of the trip.

EXERCISE 36 MAPS SHOWING THE SOILS OF TEXAS

Object: To familiarize the student with the soils of Texas.

Material: A map of Texas showing the different geological formations in the State. These maps may be purchased from the Department of Geology, State University of Texas, Austin, Texas, or obtained free from Bureau of Soils, Washington, D. C.

Directions: Study carefully the location of the types of soil in the State. Draw an outline map of Texas and indicate soil types thereon.

EXERCISE 37 TERRACING

Object: To build terraces on the school farm in order to prevent the washing of surface soil during heavy rains.

Material: Drainage level, leveling rod, supply of stakes made of one-inch material, four horses or mules, plow, V-drag.

Directions: Set a stake at the edge of the farm where the upper terrace is to empty its water and hold the leveling rod on the ground beside this stake. Set the level at such a place that when it is leveled up and sighted at the rod, the target will be not higher than three or four feet when it is in line with the cross hairs in the telescope. Now lower the target three-tenths of a foot (.3′), and at a distance of 60 feet (20 paces) from the first stake, move up or down the slope until the target is again in line with the cross hairs in the telescope. Drive a stake at this point, lower the target three-tenths of a foot (.3′), and locate a third point, 60 feet from the second. Proceed in this manner until the other side of the farm is reached. If necessary, a second terrace is laid out about 150 feet down the slope; use the same method outlined above.

Plow a furrow along the line of stakes first set, and back furrow until three or four rounds have been made.

Hitch to the V-drag and throw this freshly plowed ground to a ridge. Continue plowing and using the drag until the terrace is one and one-half to two feet higher than the bottom of the furrow on the upper side. The terrace should now be eighteen or twenty feet wide.

For detailed directions for building the V-drag and for terracing, see Bulletin B-23, "Terracing in Texas," Extension Service, A. and M. College.

Data:

No. of terraces	Distance apart	Fall per 100 ft.	Difference in elevation	Crops grown	Benefits derived

EXERCISE 38 — LAYING TILE DRAIN

Object: To remove surplus water from the soil by means of tile drains.

Material: Level, leveling rod, tape, marking pins, supply of stakes made from one-inch material, hatchet, tiling spade, round point shovel, tile scoop, tile hoop, supply of four-inch tile.

Directions: The outlet is located by finding the lowest point on the boundary of the field with the level and rod. A grade stake is driven at this point, even with the surface, and a long guide stake set near by in order that the grade stake may be easily found. Fifty feet from the first stake, and in the direction in which the tile is to run, set a second grade stake, and near it the guide stake, as directed for the first one. Proceed in this manner until the entire line is laid out. With the level and rod, determine the elevation of each stake, and record them in order. To work properly, the tile must be laid on a uniform grade. By comparing the elevations of the stakes, the proper fall may be determined, and the depth of the ditch at each stake computed.

Begin digging the ditch at the outlet. Remove the first layer of soil with the tiling spade, and take out the loose dirt with the round point shovel. The bottom is finished and brought to grade with the tile scoop. The tile are now laid, either by hand or with the tile hook, and enough dirt put in to hold them securely in place. After all the tile are laid, the ditch may be filled with a scraper, V-drag, road grader, or by hand.

Data:

No. of stakes	Elevation	Depth of ditch	Grade	Location	Crops grown	Benefits

EXERCISE 39 — STUDY OF ENLARGED ROOTS OF PLANTS

Object: To study enlarged roots of plants.

Material: A box of soil, a few sweet potatoes, some of which are affected with brown rot, and a sharp knife. (Other enlarged roots, as beets, carrots, turnips, etc., may be used.)

Directions: (When potatoes are used.) Place the potatoes in the box and cover them with soil. Keep the soil moist and warm. As soon as the buds and shoots develop have the students make drawings of (a) a sweet potato with sprouting buds, (b) a detached slip which is long enough to be transplanted. Cut open several potatoes that are affected with brown rot and examine them closely. Make drawings of these showing the affected parts.

If other roots, such as carrots, beets, etc., are to be used, a study of the root system in general may be made, (a) as to shape of root, (b) development of lateral roots, and (c) arrangement of leaves.

Data:

Root studied	Shape	Development of lateral roots

Conclusions.

EXERCISE 40 A STUDY OF POTATO VARIETIES

Object: To study varieties of Irish and sweet potatoes.

Material: Specimens of common varieties of sweet and Irish potatoes may be obtained from seed companies or often from people in the local community. Obtain at least six varieties of each—sweet and Irish potatoes. Study each variety and observe size, shape, smoothness, color, soundness of flesh, and the number and arrangement of eyes.

Data:

Sample No.	Variety	Characteristics

Conclusions.

EXERCISE 41. STUDY OF CROSS SECTIONS OF IRISH AND SWEET POTATOES

Object: To study the structure of cross sections of Irish and sweet potatoes.

Material: An Irish and a sweet potato, a sharp knife, lens, iodine solution, and nitric acid.

Directions: With the knife make cross and longitudinal sections of each of the potatoes. Examine them carefully under lens. Make drawings. Apply iodine solution to each kind of potato and note the color. Blue indicates starch. Put nitric acid on other pieces of potato. The presence of protein is indicated by a yellow color.

Data:

Slice No.	Effect of iodine	Effect of nitric acid

Conclusions.

EXERCISE 42 BEDDING SWEET POTATOES

Object: To make and plant a sweet potato bed.

Material: A spade and fresh horse manure.

Directions: In a well drained place excavate the soil to a depth of eight or ten inches and construct a frame similar to that for a hot bed. (See Exercise 14.) In this excavation place about six or eight inches of manure and over this about four inches of soil. After this has stood for a few days place the potatoes in the soil as close as possible without touching each other. Cover the potatoes with about two inches of soil. Keep the soil moist. As soon as the slips are large enough they should be removed and transferred to the field.

Note.—This is called a manure bed and will work well in the warmer climates. If a bed is to be made in a colder climate more manure should be used and a provision made for protection during cold weather.

Data:

Bushels planted	Date	No. slips

Conclusions.

EXERCISE 43 STORING SWEET POTATOES

Object: To provide a place for the keeping of sweet potatoes.

Material: Lumber, saw, hammer, nails, and shovel.

Directions: Select a well drained location and dig a flat hole four inches deep, four feet wide, and ten feet long. Fill the hole with straw or corn stover. Then take six pieces 10 inches by 12 inches by 12 feet and make three troughs by nailing two planks together in trough fashion. Space these equally on the straw with the ridges up. The boards should be nailed in such a way as to leave an opening between them for air to pass up through the potatoes. After you have placed the troughs, pile the potatoes on and between them, letting them come up in the form of a ridge, say three and one-half feet high. Then support a ridge pole directly over the ridge of potatoes and cover the potatoes with boards, standing one end on the gound and one on the ridge pole. Cover these boards with from four to six inches of dirt. Leave the ends of the house open, but provide means for closing on cold days.

Data:

Bushels stored	Date stored	Date opened	Result

EXERCISE 44 TESTING TOMATO SEED

Object: To test the vitality of garden seed.

Material: Plates, garden seed, blotting paper.

Directions: Cut pieces of blotting paper to fit the plates. Upon this place ten seeds from a package of tomato seed that you expect to use in planting the hot bed. Over the seed place another piece of blotting paper and moisten. Invert another plate in order to hold it in place and leave three to five days. Test each package of seed before planting by same method. They should test 70 per cent. to 80 per cent.

Data:

Plate No.	Name of seed	No. seed	Per cent germination	Total No. seed tested

EXERCISE 45 PREPARING FOR AND SOWING TOMATO SEED IN HOT BEDS

Object: To learn how to prepare and sow tomato seed in a hot bed.

Material: A hot bed, barnyard manure, good loose loam soil, tomato seed and water.

Directions: (See Exercise 14, hot bed and cold frame construction.) Put from four to six inches of good loose loam soil in the hot bed and cover with sash or cloth. Seed should not be planted until the temperature goes down to 80 or 85 degrees F. Sow the seed in rows three to four inches apart, and from one-eighth to one-fourth inches apart in the row. Cover seed about one-half inch deep. After seeds have been covered, water the surface of the soil with a sprinkling can, being careful to distribute the water uniformly over the bed. Then cover bed.

Data:

Date	Depth	Width of rows	Amount of seed sown	No. plants secured

EXERCISE 46 STUDY OF INSECTS DESTRUCTIVE TO VEGETABLES

Object: To study the common insects destructive to vegetables.

Material: Microscope and bottles.

Directions: Make a collection of the insects that are most destructive to vegetables in your community. Put each insect, and a piece of the plant on which it is found in a bottle. If possible gather eggs produced by each insect and put them in separate bottles. Carefully watch these. If conditions are favorable some of them may hatch.

Make a careful study of each insect as follows: Appearance of adult, kind of vegetable on which found, eating habit, and methods of control.

Data:

Insect studied	Characteristics
.....	.....

Conclusions.

EXERCISE 47 STUDY OF THE COTTON PLANT

Object: To make a close study of the cotton plant.

Material: Good cotton plants of each variety grown in the region.

Directions: Make a careful study of each variety as follows: Habit of growth, arrangement of branches and flowers, number and size of bolls, weather proof feature, and lateness of maturity. Observe carefully the comparative size of plants, root systems, general form, and the arrangement of the fruiting branches on the stem of the plant.

Data:

Variety	Characteristics
.....	.....

EXERCISE 48 STUDY OF THE COTTON FLOWER

Object: To study the cotton flower.

Material: Several cotton flowers in different stages of growth.

Directions: Have each student examine a cotton flower and observe the following: Number of sepals, number of petals, number of stamen, and the number of pistils. Make a drawing of the flower. Cut the flower longitudinally and make a drawing showing the arrangement of the different parts of the flower. Open another flower that is further developed and compare them.

Data:

Sample No.	No. sepals	No. petals	No. stamen	No. pistils
.....	.....	.....	.....	.....

EXERCISE 49 A STUDY OF THE COTTON BOLL AND FIBER

Object: To study the cotton boll and fiber.

Material: Several green and open bolls of cotton, and a lens.

Directions: Study the mature bolls, noting the shape, size, form, num-

ber of prongs to the burr and the number of locks to the boll. Make a drawing showing the mature boll and another showing the burr and cotton locks.

Make a drawing of the green boll. Make a cross section of the green boll and a drawing showing the arrangement of parts.

Examine the lint on several of the bolls and note the color, length, and fineness.

Conclusions.

EXERCISE 50 JUDGING COTTON PLANTS

Object: To understand the form of a good cotton plant.

Material: If possible conduct this exercise in the field. If it cannot be conducted there specimens of cotton plants should be obtained and the exercise performed in the laboratory. Collect ten stalks of cotton.

Directions: Study each cotton stalk and score them, noting the following points: Size of plant, length of branches, length of internodes, number of branches, number of bolls, and size of bolls. Remove the cotton from the bolls and weigh it. Tabulate results and determine which is the best plant.

Data:

Stalk No.	Characteristics	Yield

EXERCISE 51 COTTON CLASSING DEMONSTRATION

Object: To understand the classes of cotton.

Material: Samples of cotton classified according to standards. (A. and M. bulletin on Classifying Cotton), several unclassified samples.

Directions: Examine the standard samples carefully and compare them with the unclassified samples. Now classify the samples into middling fair, strict middling, good middling, middling, strict low middling, low middling, strict ordinary, and ordinary.

Data:

Sample No.	Classification	Reasons.

EXERCISE 52 CLASSIFICATION OF COTTON BY STUDENTS

Object: To practice cotton classifying.

Material: Several samples of cotton.

Directions: Each student should classify the samples according to Exercise 51, and tabulate the results.

Data:

Sample No.	Classification	Reasons

EXERCISE 53 — A STUDY OF THE PEANUT PLANT

Object: To study the peanut plant.

Material: Several mature peanut plants.

Directions: Study the peanut plant and observe the general form of the plant, the root structure, and root nodules. Observe the size and arrangement of the stems, the leaves, the flowers (male and female), and the nuts. Carefully study the formation of the nuts and how the peg or nut developing part is pushed down into the ground. White a brief description of the peanut plant.

EXERCISE 54 — COWPEAS AND SOY BEANS

Object: To study the cowpea and soy bean plant.

Material: Several cowpea and soy bean plants.

Directions: Study both plants, observing the structure of the roots, stems, leaves, flowers, pods, and number of seed to the pod. Make a drawing of a leaf and a pod from each plant. Compare the two plants. If possible, obtain nodules from each plant and compare them.

EXERCISE 55 — A STUDY OF SWEET CLOVER PLANTS

Object: To study the clover plant.

Material: Sweet clover plants.

Directions: Provide each student with a sweet clover plant. Make a drawing of the plant showing the root, stem, leaves, and flowers. If several kinds of clover are available, study different kinds and compare them. With the aid of a lens study the seed.

EXERCISE 56 — STUDY OF TUBERCLES ON LEGUME PLANTS

Object: To study the tubercles of legume plants.

Material: Carefully dig up the root systems of several legume plants.

Directions: Note the number, size and shape of the nodules on the different kinds of plants. Separate a nodule from each of the host plants and make a drawing of it. Make a cross section of the nodule. With aid of a lens make a drawing of it.

EXERCISE 57 — A STUDY OF THE CORN PLANT.

Object: To study the corn plant.

Material: Seedling corn plants and mature plants.

Directions: Make a drawing of the plantlet, showing arrangement of roots, stem, and leaves. Make a drawing of the mature plant,

showing the root, stem, leaves, tassel, and ear. Label carefully all parts.

Cut a cross section of the stem and draw it. Study the cross section of the stem.

Conclusions.

EXERCISE 58 A STUDY OF THE TYPES OF CORN

Object: To study the types of corn.

Material: An ear of each of the following types of corn: dent, flint, sweet (sugar), pop, soft, and pod.

Directions: Make a drawing of each ear. Make a drawing of a kernel and a cross section of a kernel of each ear. Write a brief description of each type and compare them.

Conclusions.

EXERCISE 59 A STUDY OF VARIETY CHARACTERISTICS OF CORN PLANTS

Object: To study the characteristics of different varieties of corn.

Material: If possible mature stalks of different varieties of corn. Ears of different varieties of corn. S. D. Ed. 92, Ex. 49.

Directions: Study each type of stalk, the way the ear is attached to the stalk, size and shape of ear. Study the ear characters as follow: Shape, size, length of ear, length of kernel, hardness of kernel, arrangement of kernels, and the structure of the cob.

Data:

Conclusions.

EXERCISE 60 CORN VARIETY STUDY

Object: To study variety characteristics of corn.

Material: Ears of corn of different varieties, tape measures, descriptive outlines (see data).

Directions: Tabulate carefully the characteristics of at least five ears of each variety, on the descriptive sheet. A plus sign will indicate the presence of a characteristic. When the variety has been studied carefully, a brief description, including practically all the main points on the data sheet, should be given. Study each of the varieties of corn in the same way, observing closely variety characteristics.

Ear Characteristics

1. Shape of ear.
   a. Cylindrical, partly cylindrical, or distinctly tapering.
2. Length of ear.
   a. Long—over 10 inches, medium—8-10 inches; or, short—under 8.

3. Circumference.
   a. Large—over $7\frac{3}{4}$ inches; medium—$6\frac{3}{4}$-$7\frac{3}{4}$ inches; or, small—under $6\frac{3}{4}$ inches.
4. Rows of kernels.
   a. In pairs or straight.
5. Number of rows.
   a. Many—over 20; medium—14-20; or, few—under 14.
   b. Number of dropped rows.
6. Space between rows.
   a. Wide, medium, or narrow.
7. Grains on cob
   a. Firmness—firm, medium, or loose.
   b. Color—yellow, white, red, or mixed.
   c. Indentation.
      1. Creased dimple, rough crease, pinched, beaked, or bridged.
   d. Shape.
      1. Wedge, square, parallel sides, or pointed.
   e. Depth.
      1. Long, medium, or short.
   f. Width in proportion to length.
      1. Narrow—twice as long as wide.
      2. One and one-half times long as wide.
   g. Uniformity.
      1. All grains uniform in size and shape.
   h. Composition.
      1. Starchy, medium starchy, medium horny, or horny
   i. Germ.
      1. Large, medium or small.
      2. Character—full, sunken or smooth, blistered, bright or dull, oily or dry.
8. Butt.
   a. Even or flat, moderately rounded, deeply rounded, compressed or swelled.
9. Tip.
   a. Exposed, nearly covered or covered.
10. Shank.
   a. Small, medium or large.
11. Cob.
   a. Size, small, medium or large.
   b. Color—red, pink or white.

Data: (Explanatory section.)

Ear Characteristics	No. of Ear					
	1	2	3	4	5	
1. Shape of ear.						
a. Cylindrical.						
b. Partly cylindrical.	*		*		*	**
c. Distinctly tapering.		*				
2. Length of ear.						
a. Long—over 10 inches.	*		*	*	*	**
b. Medium—8-10 inches.		*				
c. Short—under 8 inches.						

*Characteristic present. **Characteristic predominating in variety.

EXERCISE 61 GERMINATING SEED CORN

Object: To test the germinating power of seed corn.

Material: One hundred ears of corn, a germinating box, and sand. S. D. Ed. 92, Ex. 53.

Directions: Lay the ears of corn that are to be tested in a long row, side by side, where they will be undisturbed until the test is completed. Number the ears from one to one hundred. Commencing at the left end of the row, remove six kernels from each ear, two near the butt, two near the middle, and two near the tip. These kernels may be taken out easily with a knife. Place the kernels of ear No. 1 in the sand of the box in square No. 1, and the six kernels from ear No. 2 in square No. 2, and so on. Keep the germinator moist and at a temperature of from 70 to 80 degrees F. for seven or eight days, when the test should be completed. Remove the kernels from the tester and count the number that have germinated from each ear. Any ear that does not show 100 per cent. germination should be discarded.

Data:

Dates of testing	Ear No.	Per cent germination

EXERCISE 62 JUDGING SINGLE EARS OF CORN

Object: To study the ideal ear of corn.

Material: Several ears of corn, score cards.

Directions: By the aid of the following score card, score several ears of corn.

1. Trueness of type..... 10
2. Uniformity 10
   Grain.
   Color.

3.	Shape of ear	10
4.	Length of ear	10
5.	Circumference of ear	5
6.	Butt of ear	5
7.	Tip of ear	5
8.	Shape of kernel	10
9.	Space between the kernels	10
10.	Size of cob	10
11.	Market conditions	5
12.	Percentage of corn	10
		100

EXERCISE 63 PLACING SINGLE EARS OF CORN

Object: To gain experience in scoring corn.

Material: Several ears of corn, single ear score cards.

Score and place a number of samples.

(See Exercise 64 for data.)

EXERCISE 64 JUDGING TEN-EAR SAMPLES

Object: To place ten-ear samples of corn.

Material: Several ten-ear samples of corn.

Directions: Start with the poorer samples and by a process of elimination discard the poor. By means of a detailed study of each sample place them in such a way that there will be the first, second and third placing. Place the best sample first, the second second, etc. Give a percentage value to each sample, calling sample No. 1 100 per cent. perfect.

Data:

Placed sample No. — over sample No. — because
Placed sample No. — over sample No. — because
Placed sample No. — over sample No. — because
Placed sample No. — over sample No. — because

EERCISE 65 Repeat Exercise 64.

EXERCISE 66 A STUDY OF THE OAT PLANT

Object: To study the oat plant.

Material: Green and mature oat plants.

Directions: Provide each student with a green and a mature oat plant. With the aid of a lens study the plants according to the following outline:

1. Leaves, parts, blades, sheath, ligule, and leaf auricle.
2. Roots, temporary, permanent.
3. Stem.

4. Flower.
5. Heads.
6. Grains.
7. Composition.
8. Varieties.
9. Adaptation.
10. Comparison with other grains.

EXERCISE 67 — SCORING AND PLACING OAT SAMPLES

Object: To determine the relative merits of oat samples.

Material: Five samples of threshed oats, tester, score cards.

Directions: Score each of the oat samples according to the following score card; and place first, second and third best samples.

Data:

SCALE OF POINTS	Perfect score	Student's score	Corrected score
1. Uniformity of grades	10		
2. Color	10		
3. Size and plumpness	15		
4. Per cent hull	15		
5. Per cent foreign matter	15		
6. Per cent damaged grain	15		
7. Weight per bushel	20		
Total	100		

Estimate approximate per cent of hull in each sample as follows: (Samples weighing 32 pounds will have approximately 30 per cent. hull.)

Standard Weight : Sample Weight : : X : standard per cent.

32 : Sample Weight : : X : 30

(Substituting)

32 : 31 : : X : 30

(Solving)

31 X—960.

X— 30.96

Note: This sample has approximately 1 per cent more hull than the standard. (See score card for cut.)

Placed sample No. 3 over sample No. 1, because: (reasons) . . . . . .
Placed sample No. 1 over sample No. 5, because: (reasons) . . . . . .
Placed sample No. 5 over sample No. 4, because (reasons) . . . . . .

EXERCISE 68 — A STUDY OF THE WHEAT PLANT

Follow the outline as given in Exercise 66. Use wheat instead of oat plants.

EXERCISE 69 — TREATMENT OF GRAIN FOR SMUT

Object: To treat small grain for smut.

Material: Two tubs with drains near the bottoms, and a box that is a little higher than a tub.

Directions: Make a 40 per cent. solution of formalin by mixing one pint of formalin with fifty gallons of water. This will fill a tub

about two-thirds full of solution. Pour in about a bushel of the seed to be treated and stir thoroughly. The smut balls and light kernels will rise and may be skimmed off. As soon as the skimming is completed the solution may be drawn off through the hole in the bottom. Empty the grain on the floor and dry. Reverse the tubs and they are ready for more grain.

Hot Water Treatment

Soak the seed for three hours in hot water. Then soak for ten minutes in water at a temperature of 133 degrees F. Cool immediately. A temperature of less than 130 degrees F. will not kill the smut germs. A temperature of 135 degrees will injure the germinating power of the seed. The operator should be very careful and have complete control of the temperature.

EXERCISE 70 JUDGING SORGHUM HEADS

Object: To better understand the sorghum heads.

Material: A number of heads of different varieties of sweet and grain sorghums.

Directions: With aid of the following score cards, study the heads of sorphum:

1.	Uniformity of head and kernel	20
2.	Shape of heads	10
3.	Size of heads	5
4.	Arrangement of spiklets	20
5.	Shape of kernel	5
6.	Size of kernel	5
7.	Color of kernel and glume	5
8.	Freedom from shattering	5
9.	Secretion	10
10.	Market condition	15
	Total	100

EXERCISE 71 A STUDY OF BERMUDA GRASS

Object: To better understand the habits of Bermuda grass.

Material: Some growing Bermuda grass plants.

Directions: Note the way that Bermuda grass throws out runners and how these stems root to the ground. Dig up one of these plants and make a drawing showing the principal root systems and the new root systems, formed where the joints root down. Study the root, stem, and flower parts. Write a brief description of Bermuda grass.

EXERCISE 73 — A STUDY OF JOHNSON GRASS

Object: To better understand the habits of Johnson grass.

Material: Johnson grass plants with roots and root stocks.

Directions: Study the root systems carefully and note the differences between the primary root systems and the secondary systems and tertiary system. Have the student make careful drawings showing these systems. Cut a cross section of the root and draw. Write a detailed description of the plant. Give methods of control.

Conclusions.

EXERCISE 73 — IDENTIFICATION OF FARM SEEDS

Object: To identify the different farm seeds.

Material: A collection of different farm seeds.

Directions: Place samples of the seeds in dishes or bottles and number each dish. Have the student identify the seed and record the number and name. This will help the student to remember the seed characteristics.

Data:

Bottle No.	Seed	Characteristics

Conclusions.

EXERCISE 74 — TAKING A FARM INVENTORY

Object: To estimate value of farm property.

Material: Note-book, pencil.

Directions: Since a farm inventory is a classified list of all farm property, with estimated value, the best time to take it is at the close of the farm year when all surplus crops and stock have been disposed of. The Christmas vacation may be used to a good advantage in working this exercise. Get all the implements and equipment together. Collect the tools that have been left in the field or lent to neighbors. List each item, and record the estimated value. The live stock inventory should show the number, kind and value of animals by groups. For instance, under the cattle inventory cows, heifers, steers and calves should be listed separately.

In order to take an inventory of feed on hand it will often be necessary to estimate the quantity by measuring the bins, cribs, hay ricks, or stacks. In order to find contents in cubic feet, multiply length, breadth and thickness and estimate about 500 cubic feet to the ton for hay, and about 3 cubic feet for ear corn, and $1\frac{1}{4}$ cubic feet of shelled grain to the bushel. The inventory should be arranged to show the value of each item, the value of each group, and the total value.

Data:

1. Farm. — Estimated value.
   - A. Land.
   - B. Buildings.
2. Live stock.
   - A. Cattle.
   - B. Horses.
   - C. Mules, etc.
3. Machinery.
4. Feed.
   - A. Grain.
   - B. Roughage.
5. Seed.

Total value.....

EXERCISE 75 PREPARING FARM PRODUCTS MAPS OF TEXAS

Object: To prepare farm products maps of Texas.

Material: An outline map of Texas, Texas almanac and bulletins issued by the U. S. Census Bureau.

Directions: Have the students make a map of Texas showing the different products of Texas.

These products may be shown by coloring different portions of the map.

EXERCISE 76 PREPARING EXHIBITS OF FARM PRODUCTS

Material: S. D. Ed., p. 87.

Directions: The teacher should work this exercise out under the conditions which he finds in his local community. He should keep in mind the quality of the exhibit and the beauty of it. When the exhibit is finished it should show the quality, kinds and a general summary of the products of the community. This may be used to advantage in connection with the school fair.