SIXTY LESSONS IN AGRICULTURE

BUFFUM AND DEAVER

Apple Trees in Bloom

SIXTY LESSONS IN AGRICULTURE

BY

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PRACTICAL FARMER

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PREFACE

This book is intended for the sixth, seventh, or eighth grade; and the subject matter and language are well within the range of pupils of these grades. The treatment is not technical, and therefore the book can be used in schools whose teachers have had no special training in the subject of school agriculture.

The aims of the book are to increase the efficiency of farming operations and to improve the general character of farm life by presenting useful information and by giving directions for practical laboratory work which may be done at school or at home. These exercises are easy to perform and require no special apparatus. If this experimental work is done with care, the pupil will acquire, in addition to the fundamental facts of agriculture, an excellent training in scientific methods.

The references at the end of the lessons are mainly the Farmers' Bulletins of the United States Department of Agriculture, which can be obtained free or at little cost. These should be supplemented by state bulletins and other available references bearing on local conditions. The teacher's attention is

called particularly to the following bulletins because of their great usefulness in rural school agriculture:

Exercises in Elementary Agriculture. Bulletin 186, Experiment Stations Office, Washington, D.C.

School Exercises in Plant Production. Farmers' Bulletin, 408.

Boys' and Girls' Agricultural Clubs. Farmers' Bulletin, 385.

School Lessons on Corn. Farmers' Bulletin, 409.

Forestry in Nature Study. Farmers' Bulletin, 468.

Fifty Common Birds of Farm and Orchard. Farmers' Bulletin, 513.

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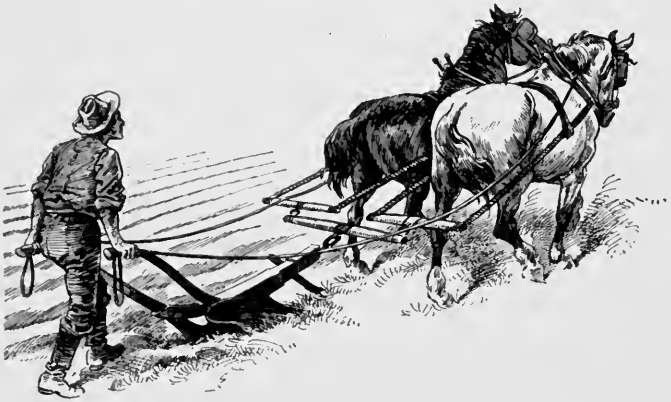
SIXTY LESSONS IN AGRICULTURE

LESSON 1

FARMING



Farming a business. — Farming or agriculture is the business of raising crops and domestic animals. A crop is anything grown from the soil, as a crop of wheat, a crop of potatoes, or a crop of apples.

There are many different kinds of farming. If the farmer cultivates large fields, we call his business *agriculture*, which means field culture. If domestic animals are raised on pasture lands, we call the business grazing, ranging, or *herding*. The business of

cultivating a small field, an orchard, or a garden is called *horticulture*, which means garden culture. The growing of flowers is called *floriculture*. The growing of trees for wood or lumber is called *forestry*. *Irrigation farming* is carried on in dry regions by applying water from streams to the soil by means of canals or water pipes. *Dry farming* is carried on in regions of little rainfall by special methods of cultivation which partially prevent the loss of soil moisture by evaporation.

A great industry. — Agriculture is the greatest industry in the world. Through it we get food, clothing, houses, and many other things which are necessary to our comfort and happiness.

Many farm products must be made over or manufactured into more useful form before they can be of service to man. This gives rise to manufacturing, which changes raw materials into useful products. Most of the raw materials in manufacturing come from the farm. The two most important lines of manufacturing are the making of food products and clothing. Wheat and other grains are ground into flour; milk and cream are made into cheese and butter; cattle, hogs, and sheep are slaughtered and converted into beef, pork, and mutton; and cotton, wool, and flax are woven into cloth.

Commerce. — Our railroad cars and ships are loaded mainly with farm products or manufactures whose raw materials come from the farm. Think of

the large crops of wheat, corn, vegetables, and fruits, and the great number of live stock which must be shipped from the farms to the cities of our country and other countries. Think of the farm products which we get from other lands, rice, bananas, spices, coffee, and tea. You will see that commerce, which is the buying and selling and transportation of goods, deals with products of the farm.

Wealth. — The true wealth of the world is the result of production from the soil and from labor. We often think of gold, or money, as wealth; but it has little value in itself. As we use the quart to measure milk, and the bushel to measure wheat and corn, so we use gold to measure the value of our wealth. If we could not exchange money for the things from the farm that we must have in order to live, all the money in the world would not be so valuable as a crust of bread.

QUESTIONS

1. What is farming?
2. Name and define the several kinds of farming.
3. What kinds of farming are carried on in the region in which you live?
4. What are some of the most important products of the soil?
5. Make a list of the products of your own locality, arranging them in the order of their importance to the community.

LESSON II

THE FARM

What constitutes a farm. — As you look over a farm you see the farmhouse, the barn and sheds, the garden and orchard, the fields and fences, the road, and perhaps a stream of water and a wood lot. All these

Modern Farmhouse and Barns

things are needed upon the farm in order to carry on the work which we call farming.

The size of farms varies from a few acres to thousands of acres. A square mile or section of land contains 640 acres, and farms in most of our country are natural divisions of a section. A half section contains 320

acres, and a quarter section 160 acres. What part of a section is 80 acres? 40 acres?

The house is for the comfort and protection of the family, and the barn and sheds for the animals, crops, implements, and vehicles. In the garden are grown the vegetables and small fruits. In the orchard grow the tree and bush fruits, such as apples, cherries, and raspberries.

A Farm Windmill

Crops. — Usually several kinds of crops and domestic animals are raised upon a single farm. In any particular year, one field on the farm may be in corn, one in wheat, one in clover or timothy for hay, and another in grass for pasture. In the pasture the live stock run free to graze upon the growing grass, and the fences keep them from the other crops.

Water supply. — Every farm must have a supply of water for the use of the family and the farm animals.

Sometimes the supply comes from a spring, but most often it comes from wells and is pumped up by hand, windmill, or gasoline engine. On some farms a stream of water flows across the fields, and this is used by the animals for drinking. A good, pure water supply which does not fail during a long drouth of summer is of great value to the farm.

Good Roads are an Aid to the Farmer

Woodlands. — The wood lot produces lumber for buildings and fences and wood for fuel. Very often the hilly part of a farm, where crops cannot be successfully grown, is kept in timber. If a brook or creek flows through the farm, there is usually a strip of woodland on each side of the stream. Such a woodland is often used as a pasture as well as for a supply of timber. In parts of the country the wood lot consists of planted trees, and is placed where it protects the house and

barn from the severe cold winds of the winter and the destructive storms of summer.

Roads. — Every farm must be connected with the surrounding country by roads. Crops must be hauled to the market town and other goods brought back. Members of the family must travel over roads in going to town, church, and school, and in making neighborhood visits.

QUESTIONS

1. What are some of the most important features of a good farm?
2. Learn the sizes of several farms in your neighborhood. What is the average size?
3. What are the uses of a wood lot?
4. Of what value are good roads to a farmer?

PRACTICAL EXERCISES

1. Draw a map of the farm on which you live, showing the fields, roads, lanes, wood lot, orchard, garden, house and lawn, barn and barn lot, and other lots.
2. If you do not live on a farm, draw a map of an imaginary farm.

LESSON III

THE FARMER AND THE WEATHER

Weather and climate. — The farmer lives in close touch with nature. He is working with plant and animal life and is interested in all those things that affect plants and animals. Perhaps there is nothing of greater importance to him than weather and climate. Weather is the condition of the air at any given time. Climate is the average of conditions which prevail for a long time, a season, a year, or many years. The conditions of the atmosphere that we are most interested in are temperature, moisture, and winds.

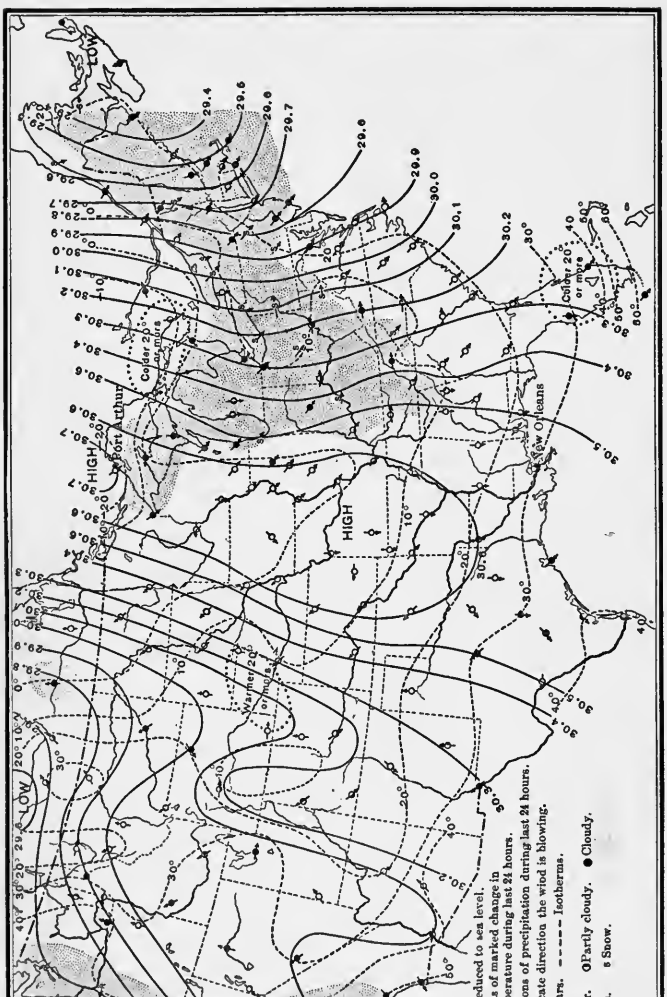
Seasons. — You have noticed how plant life changes with the seasons. During cold weather, most plants go through a resting period. As the frosts of autumn come, the leaves lose their green color and finally die. The plants then remain inactive until the warm spring comes again. The seeds which ripen in fall remain dormant through the winter and begin to grow when the air and soil become warm in the spring. As the days grow longer and warmer the plants grow more rapidly, until they mature in midsummer or early fall.

Work changes with the seasons. — The seasons largely control the work upon the farm. The times of

planting and harvesting are the busiest seasons, while the winter is the time of least work, although the good farmer can find plenty of work to do even in the winter. The work from day to day is controlled by the weather. A heavy rain may prevent the farmer from tilling the soil or harvesting the hay or grain. A clear day with dry air is just the time for cutting hay so that it will dry quickly.

A great problem. — The growing season is the most important time of year for the farmer. It is the period from the last killing frost of spring to the first killing frost of autumn. The longer the growing season, the greater is the yield of farm products. One of the great problems for the farmer is to arrange the planting of his crops to avoid the killing frosts of spring and yet have them mature before the autumn frosts. A late frost in the spring or early summer sometimes does great damage to plants, especially to fruit trees. An early frost in the fall may injure the crops. Sometimes a hard frost occurs before the corn is ripe, and serious damage to the crop results. In sections of the country where the growing season is too short for the successful growing of a crop, much work is being done in plant breeding to secure new varieties which will mature early and thus be safe from frost.

Rainfall. — The total amount of rainfall during the year is of far less importance than the amount and frequency of rain during the growing season. In the corn belt of the United States the yield of corn from year


LOW
HIGH
HIGH
LOW
LOW
Port Arthur
Kansas City
New Orleans
Colder 20° or more
Warmer 20° or more
Colder 20° or more
Barometer reduced to sea level.
Areas of marked change in temperature during last 24 hours.
Regions of precipitation during last 24 hours.
Arrows indicate direction the wind is blowing.
Isobars.
Isotherms.
Clear.
Partly cloudy.
Cloudy.
Rain.
Snow.

WEATHER MAP

to year is determined more by the rainfall than by anything else. A long dry period during the summer will always cause a sharp decrease in corn production.

Sunshine. — A growing plant needs sunshine, and the longer the day and the clearer the sky, the more rapid will be the growth of crops. North of our country the growing season is quite short, but the days are longer, and the longer periods of sunlight cause the crops to ripen earlier than in more southern regions where the days are not so long. Dry, sunny days are of especial value in the harvesting of hay. Corn is a crop which requires much sunshine. In warm countries which are very cloudy, corn does not thrive.

Effects of winds. — The wind is of great interest to the farmer. Sometimes crops are damaged by hot, dry winds. Occasionally corn, wheat, and oats are blown down by heavy winds and the crops are damaged. To protect the house and barn from windstorms in the summer and cold winds in the winter, the farmer plants a shelter belt of trees.

Use of farm buildings. — The need for a house and other farm buildings is largely due to the weather. The farmer builds a house for shelter from the weather and builds barns for his live stock, and granaries for his grain. In the winter a large part of the food of animals is used as fuel to keep them warm instead of being used to make flesh. It pays to protect animals from the cold, for less food will be used to keep up the

heat of the body and they will fatten with less food than if left out in the wet and cold.

The Weather Bureau. — The farmer is greatly benefited by the forecasts of the Weather Bureau. In fruit-growing regions, particular attention is given to frost predictions. Very often a fruit crop, worth

Smudge Pots are burned in the Orchard to prevent Frost

thousands of dollars, is saved by starting fires in the orchards to prevent the frost. Very many farm operations can be controlled by knowing the weather which is to come in the next thirty-six hours. The intelligent farmer pays close attention to the forecasts of the Weather Bureau and gives no attention to the quack forecasts for long periods of time which are so often given in patent medicine almanacs.

QUESTIONS

1. What is the difference between weather and climate?
2. How do the seasons govern the farmer's work?
3. What is the growing season?
4. What is the average length of the growing season in your locality?
5. What crops are sometimes damaged by late frosts in spring? What crops are sometimes damaged by early frosts in autumn?
6. How may orchards be protected from frosts?
7. What crops are sometimes injured by a long drouth in the summer?
8. What are the most important climatic conditions needed by growing crops?

PRACTICAL EXERCISES

1. Keep a record of daily weather observations. In the morning and evening note the temperature, direction and velocity of the wind, the condition of the sky, and precipitation if any. Use the following form of weather record:

Date	Hour	Temperature	Direction of Wind	Velocity of Wind	Sky	Rain or Snow	Weather since Last Observation
Sept. 10	8 A.M.	55	N.W.	Brisk	Clear	——	Frost at night
Sept. 10	4 P.M.	70	S.W.	Light	Cloudy	——	——————

2. Study the daily weather map and weather forecast of the Weather Bureau, which you may find in a daily newspaper. Cut out the weather maps, and fasten to a sheet of cardboard those for one month. To make the dim lines stand out clearly, color them with oil crayons. Use red to color the isobars around

a Low, and blue to color those around a High. Use another color for the isothermal line of freezing, and still another for the isothermal line of zero.

3. Keep a set of notes on the seasonal changes in plant and animal life, such as the dates of bird migrations, blooming of early wild flowers, blooming of fruit trees, leafing of forest trees, and the planting and harvesting of crops.

REFERENCES

Write to the director of the Weather Bureau section in which you live for publications on the climate of your section. Write also to the Agricultural Experiment Station in your state for bulletins on the climate of the state.

Farmers' Bulletins: 104, Notes on frost; 401, Protection of orchards in Pacific Northwest from spring frosts by means of fires and smudges.

LESSON IV

THE SOIL

How soil is made. — By the action of air and water, and heat and cold, the solid rock of the earth's surface decays and breaks up into fine particles. The layer of fine mineral particles is called soil. But in addition to the rock particles, soil contains water, air, minute living forms, and decaying plant and animal matter. All of these things are necessary to plant growth.

Water in the soil. — When soil is saturated, all the spaces between the soil grains are filled with water and the soil contains no air. Part of the water will drain away and air will flow in to take its place. The water which drains off from a saturated soil is called *free water*. The water remaining in the soil exists as thin sheets or films around the soil particles. This is called *film water*. In this water is dissolved the food for the growing plants.

Air in the soil. — The roots of growing plants need air. The useful bacteria in the soil also use air. Therefore it is necessary that there be a free movement of air in the pores of the soil. Too much water in the soil prevents the air from reaching the plant roots, and the crops do not thrive. If the soil remains saturated too long, the plants die for lack of soil air.

(22) ROOTS, LEAVES, AND STEMS OF THE FOREST MAKE HUMUS

Living forms in the soil. — The living forms in the soil are mainly microscopic plants called bacteria. These soil bacteria, as you will learn in the next chapter, add much to the fertility of the soil.

Humus. — The dead organic matter, the remains of plants and animals, is called humus.

The roots, leaves, and stems of plants furnish much of the humus. The bodies of dead earthworms and insects in the soil also add to the total amount of humus.

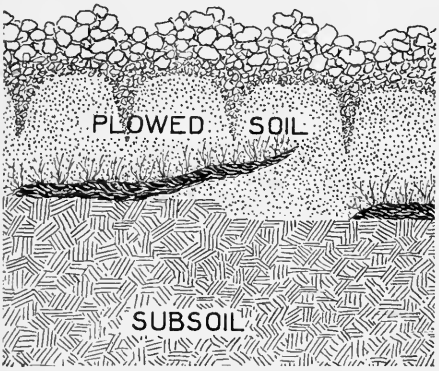
Soil particles. — According to their size, we divide the soil particles into three classes; clay, silt, and sand. The very finest particles form clay. Larger particles, but still quite small, form silt. Coarse soil grains, usually particles of quartz rock, are sand. These grains of sand are large enough to be seen with the naked eye.

Kinds of soil. — Soils made up mostly of clay or silt, or clay and silt together, are called *clay* soils. Soils made up mostly of sand are called *sandy* soils. Soils which contain large proportions of clay and silt and sand are called loams. If the amount of sand is greater than the amount of silt and clay, we have a *sandy loam.* If the amount of silt and clay is greater than the amount of sand, we have a *clay loam.*

If a soil contains a large amount of humus, it is called a humus soil. The soil of a swamp is of this kind.

Topsoil and subsoil. — The layer of soil which is plowed and worked is called the *topsoil.* The part

underneath is the subsoil. The topsoil is usually much looser than the subsoil, and darker because of the humus it contains. On the steep bank of streams you can often see clearly the difference between the dark topsoil and the lighter-colored subsoil.



Heavy and light. — The farmer often speaks of heavy soil and light soil. A heavy soil is one through which it is hard to pull the plow. A tough clay is hard to plow and is called a heavy soil. A soil that is easy to work is called a light soil. Sandy soils are easy to plow and therefore are light soils.

QUESTIONS

1. What things constitute soil?
2. Define free water, film or capillary water.
3. What is humus?
4. What are the classes of soil on the basis of the size of the soil particles?
5. How does the topsoil differ from the subsoil?
6. What is meant by a light soil? By a heavy soil?

PRACTICAL EXERCISES

1. Bring to school samples of several kinds of soil that are found in the neighborhood.

2. Into a tall fruit jar that is nearly full of water, place a handful of garden loam. Stir thoroughly for a minute or two, and let the jar stand for several days. After the stirring has ceased, the sand will settle to the bottom in a very short time; the silt will settle in a much longer time and form a distinct layer above the sand; the clay will settle so slowly that it will take several days before the water becomes quite clear. At the end of the experiment you will have the soil divided into three fairly distinct layers.

REFERENCES

Soil bulletins of the Agricultural College and of the Experiment Station in your state. Farmers' Bulletins: 77, Liming of soils; 245, Renovation of worn-out soils; 257, Soil fertility; 266, Management of soil to conserve moisture; 406, Soil conservation.

LESSON V

FERTILITY OF THE SOIL

Fertile soil. — The chemical composition and the physical condition of the soil determine its fertility. In order to be fertile a soil must have the mineral and organic matter which gives food to the plants; and it must also be in such a condition that the growing plants can secure their food.

Plant foods. — The food of plants consists mainly of carbon dioxide, water, oxygen, and compounds of nitrogen, phosphorus, potassium, and calcium. Many other substances furnish plant food, but these are of greatest importance. Plants get carbon dioxide from the air, water from the soil, and oxygen from the air and the soil. The other food materials come from the organic and mineral matter in the soil.

Nitrogen is one of the most important elements in plant food, and the securing of the needed supply of nitrogen compounds is always one of the greatest problems to the farmer. Although four fifths of the air is nitrogen, yet plants cannot take nitrogen directly from the air. They must obtain it from the nitrogen compounds in the soil. Salts, called nitrates, are the best nitrogen-giving foods for plants. These salts and the organic matter in the soil furnish nitrogen.

Barnyard manure is added to give nitrogen and other elements to the soil. Before the nitrogen in the organic matter can be used by the crops, it must be changed into nitrates by the bacteria in the soil. Thus the soil bacteria are the direct producers of nitrogen plant food.

THE PLANT ON THE LEFT WAS GROWN IN POOR SOIL, THE OTHER IN GOOD SOIL

The legumes, such as the clovers, peas, beans, and alfalfa, in addition to furnishing valuable crops for man, are of great value in increasing the nitrogen supply. On the roots of the legumes may be found small swellings or nodules, in which are colonies of bacteria which have the power of taking the nitrogen from the air

and changing it into nitrogen compounds which can be used by the legumes themselves and the succeeding crops.

Phosphorus and potassium. — Crops remove such large amounts of phosphorus and potassium from soils that it is necessary to replace these elements by the use of fertilizers. Barnyard manure, bone meal, and phosphate rock are used to enrich the soil with phosphorus. Potassium is added to the soil in manure, potash, and wood ashes.

If the soil is poor in calcium, lime, a compound of calcium, is added. Lime is more often added for other reasons, however, than that of supplying calcium.

The other elements of plant foods are used in such small amounts that usually the supply in the soil is ample; and it is not often necessary to add them by use of fertilizers.

Condition of the soil. — The proper physical condition of the soil enables the crops to obtain the food supply present in the soil. When we use such words as mellow, friable, fine, loose, porous, hard, cloddy, compact, sour, and sweet, we are speaking of the physical condition of the soil. Fineness or good texture is the most important physical property of a soil, and it is one of the main objects of tillage. If the soil is cloddy, the plant food is locked up inside the clods, and is beyond the reach of the roots. More soil water and soil air are held in a soil of fine texture than in one of coarse texture.

Effect of humus. — Humus is valuable in securing the proper texture of soil. A gravelly soil or sandy soil may be too loose for the plants to get a proper hold and enough water. Humus will improve it by binding the coarse particles together and by increasing the capacity for film water. A heavy clay soil may be too compact to allow proper drainage of surplus water and free access of air. Such a soil can be made lighter by the addition of humus. Thus, humus lessens the difference between a heavy clay soil and a light sandy soil by making them more loamy. The great value of barnyard manure is that it not only furnishes substances which are plant foods, but it also adds humus to improve the soil texture.

Effect of sand. — Sometimes sand is mixed with a tough, heavy clay to make it easier to till and to give greater circulation of the soil water and soil air.

Effect of lime. — Lime is sometimes put in a heavy clay soil to make it more porous and easier to work. At times a soil becomes sour by the presence of an acid, and its fertility is reduced. The application of lime will destroy the acid and thus sweeten the soil. Lime is more often applied for this than for any other purpose.

QUESTIONS

1. What are the two things that determine the fertility of the soil?

2. What are some of the most important elements that plants require from the soil?

3. How do plants obtain nitrogen?
4. How may nitrogen be increased in the soil?
5. By what methods do farmers keep up the fertility of the soil?
6. What is meant by the term "texture of the soil"?
7. What condition of soil requires an application of lime?
8. How does humus improve the soil?

PRACTICAL EXERCISES

1. Dig up the roots of clover or alfalfa and find the nodules in which are the colonies of bacteria that take nitrogen from the air and build it into nitrogenous substances that the plants can use.

2. Make a ball of puddled clay and leave it to dry. Note the hard clod that forms. Make a similar ball of clay mixed with a little sand and one of clay mixed with a little lime. Do the dried balls form hard clods? How does lime or sand affect the texture of a clay soil?

REFERENCES

Farmers' Bulletins: 44, Commercial fertilizers, composition and use; 192, Barnyard manure.

LESSON VI

MOISTURE IN THE SOIL

The water in the soil is one of the most important agents of fertility. No plants can grow without moisture, and it is only through the water that plant foods find their way from the soil into the plant. The water in the soil may be in any or all of the following three conditions: vapor, film moisture, and free water.

Vapor. — The soil may be so dry that it has little moisture except that which is in the form of water vapor or gas. The soil absorbs much water vapor, but in this state the water is probably not used to any great extent by plants.

Film moisture. — Much water is held in the soil in the form of film moisture. By film moisture is meant the water which clings around the soil particles and travels from one soil particle to another, if they are close enough together. In this way, the moisture is always moving from a moist to a drier soil. In a soil of fine texture, this film moisture will rise many feet above the level of the ground water. It is this film moisture that is of so much use to the plant and value to the farmer, because it supplies the plant with its water and its food.

Free water. — Water occurs in the soil as free water. The water in a well, or which stands in a post hole when dug in a wet time, comes from the free water in the soil. The free water of the soil finds its way out by drainage, appearing as springs where it comes to the surface. For most crops free water should not come closer to the surface of the soil than from two to four feet.

Water brings food to plants. — Water is the carrier by which plants obtain their food from the soil. A constant current is slowly passing upward from the roots and evaporating from the leaves into the air. Thus a large amount of soil moisture passes from the ground into the growing plants and then into the air as water vapor. One half of all the moisture that falls on the land in the form of rain or snow soon evaporates directly from the soil. As the moisture evaporates from the surface of the soil, more soil water moves up from below, and thus much moisture is lost which might be used by the growing crop. One of the objects of tillage, by making a mulch of loose soil, is to prevent evaporation at the surface of the ground, and thus save the soil moisture for the crop.

Sources of water. — In humid regions, the moisture is stored in the soil by the falling of rain or snow. In the farm lands of dry regions, water is applied to the soil by irrigation. Snow or rain falls upon the mountains in the arid regions, and the water is carried by streams from the mountain slopes through the more

level desert plains. By dams across the streams, the water is turned into canals and then spread over the land that is to be irrigated.

The preparation of the soil so it will absorb the greatest amount of moisture from rain and snow

Mountain Stream

and the proper spreading of the water in the arid or semiarid belt by irrigation are important parts of farm practice.

QUESTIONS

1. In what three conditions does water exist in the soil?
2. In which condition is the water most useful to growing plants?
3. In what ways does the soil lose moisture?

4. What are the sources of soil water?
5. What is irrigation?

PRACTICAL EXERCISES

1. Place two or three cubes of sugar, one upon the other, in a saucer, and pour in a small quantity of red ink. This shows the upward movement of film moisture by the force of capillarity. Tie pieces of cloth over the ends of three tall lamp chimneys. Place these in a pan or a large flat dish. Fill one lamp chimney with dry sand, another with dry loam, and the other with dry clay. Now pour water into the pan or dish to a depth of about an inch. In which soil does the moisture move upward most rapidly?

2. Repeat the above exercise, using chimneys of the same size, and equal volumes of sand, loam, and clay. Place each chimney in a separate saucer or other small dish. Measure the water added to each to determine which soil can hold the largest amount of film moisture. Be sure that the depth of water remaining in the bottom of each saucer is the same when you compare the amounts of water absorbed by the three soils.

In these two exercises it is necessary to place a small wedge, a bit of cardboard or match, under each lamp chimney so that it may not rest so close to the bottom of the dish as to prevent the entrance of water.

If long glass tubes could be used instead of lamp chimneys, it would be possible to show that film water will rise higher in a soil of fine texture than in one of coarse texture.

LESSON VII

TILLING THE SOIL

Purpose of tilling the soil. — The soil is tilled for the purpose of making it more suitable for the growth of useful plants. There are but few crops which will grow in untilled soil. In general, good soils need only to be well tilled in order to produce large crops.

Plowing. — The ground is plowed in order to loosen the soil and to turn under the layer of vegetable matter lying on the surface. By harrowing, the soil is made loose and fine in texture, and the humus thoroughly pulverized and mixed with the soil.

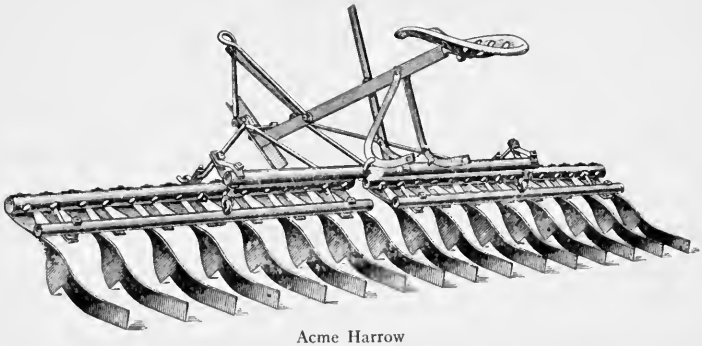
Porous soil. — It is necessary to loosen the soil in order to plant the seeds which must be covered, and for the growing plants to take root. A loose porous soil will absorb more rain than a compact soil. In a loose soil the air can readily reach the plant roots and the useful soil bacteria. The finer the texture of the soil, the more film water it can hold, and the more plant food which the film water can dissolve from the soil particles.

Soil mulch. — In dry regions the soil is tilled in order to prevent loss of soil moisture by evaporation. By making a layer of fine, loose soil on the surface, the upward capillary movement of film water is checked,

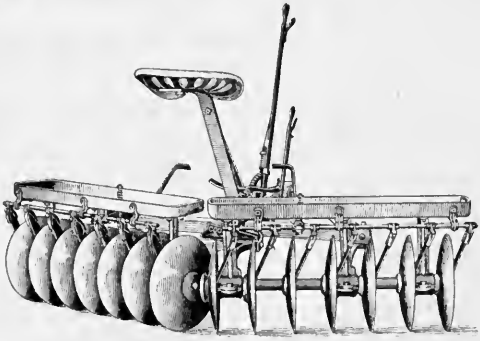
and thus it is retained in the ground. This layer of pulverized soil is called a soil mulch. In other parts of the country where the summers may be dry, a soil mulch is formed by shallow cultivation to save the

Deep Plowing

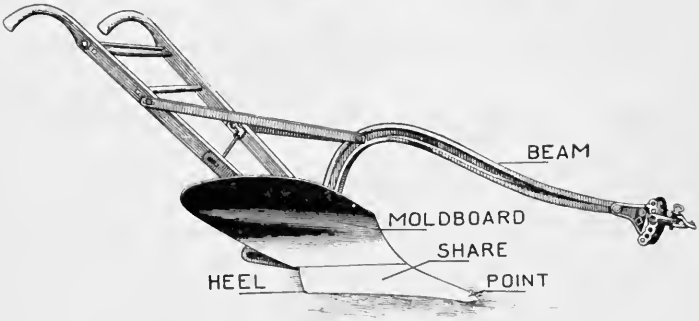
water for the roots of the crops. Although there may be no need of cultivation to kill the weeds, yet the cultivated crops are often given a shallow plowing after each summer rain to form the mulch and thus check evaporation.



Acme Harrow



Disk Harrow



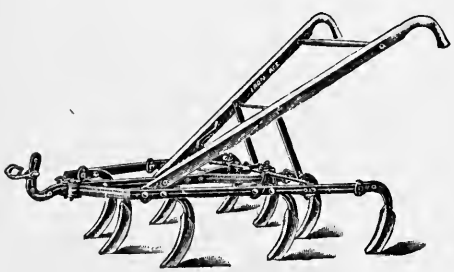
General Purpose Plow

Some Implements for Working the Soil

Implements. — The implements used to work the soil are the spade, hoe, plow, harrow, roller, clod crusher or planker, and leveler. Tilling requires more work than other farm operations, and it is usually done by hitching horses or mules, or engines, to the tilling machinery.

Wet soil. — Some heavy soils of fine texture, like clay, may be spoiled if they are tilled when too wet. This puddles the soil so that air and water cannot pass through it. A soil that is apt to puddle can be improved by adding lime, sand, or humus.

Cultivation. — The tilling of soil around plants is called cultivation. Some crops are sown so close together that they are allowed to grow without cultivation. Other crops are drilled in rows or planted in hills so that the soil between the rows or around the hills can be cultivated.



CULTIVATOR

Cultivators. — In earlier times cultivation of the soil was practically all done with a hoe. The labor was severe, and only a small patch of land could be hoed by one man. Now crops are cultivated with machines, called cultivators, which are drawn by horses. A cultivator may stir the soil along a row or between several rows

at a time. The hand hoe is now little used except in gardening, or to thin the plants where they are too thick in the row, or to kill the few weeds that may be left by the cultivator.

Cultivation is so valuable to all plants that we are beginning to cultivate crops like hay and small grains. This is done with harrows or with machines called horse weeders that scratch the ground without injuring the plants.

Tillage or cultivation of the soil makes the food materials in the soil more available to the plants, saves moisture, destroys weeds, and trains the plant roots to go deep into the soil.

QUESTIONS

1. What is tillage?
2. What results are obtained by tillage?
3. What are the advantages of having the soil loose and in fine texture?
4. What is a soil mulch? How is it obtained?
5. Under what climatic conditions is a soil mulch of especial value to crops?

PRACTICAL EXERCISES

1. If the pupils live in town, a visit to an implement store should be made in order to study plows and cultivators.
2. Fill two large metal cans or pails with moist soil. Compact the soil by jarring the sides of the vessels. Weigh each, and place them in a dry place for a week. Do not disturb the soil of one, but make a soil mulch on the other by stirring each day the soil to a depth of two inches. Weigh each at the end of a week. Which has lost the greater amount of moisture?

LESSON VIII

THE PLOW AND PLOWING

Plows were probably the earliest farm implements used by civilized man. These plows were made out of crooked limbs of trees. At first they were drawn or pushed through the soil by men. Afterward they were drawn by oxen or horses. Now plows are made of steel and are drawn by horses, or mules, or steam engines, or gasoline tractors.

Plowing. — The mark made by the plow, as it is pulled along through the soil, is called a furrow, and the part cut loose by the plow and turned over, is the furrow slice. When sod land is plowed, the furrow slice is turned upside down, covering the vegetable matter as deeply as the ground is plowed. Good plowing twists and breaks and crushes the soil, leaving it rough and open to the air, so other tools, which are used afterwards to smooth and fine the surface, can do the best work. Plowing, then, kills the plants which may be growing on the soil, buries the vegetation, and mixes it with the soil, breaks and pulverizes the soil particles, loosens the soil and lets the air and sunshine and water get into it and act upon it. Plowing helps to dry out wet soil and aids the movement of water in the soil.

How deep to plow. — Plows are not made to go very deep into the soil. Some sod lands are plowed less than three inches deep, and rarely does the deepest

Steam Plow at Work

plowing extend more than ten or twelve inches below the surface. Usually, farmers run their plows six or seven inches deep.

When to plow. — The time the farmer should plow his land depends on the kind and condition of the soil,

and the kind of crops to be grown. Clay land, plowed in the fall, is better for wheat to be planted in the spring, and, on the other hand, spring-plowed land seems to produce better crops of corn or potatoes. Some soils may be spoiled if plowed when too wet, and in some instances a poor crop may be produced if too much of the subsoil is turned out on top of the land.

Kind of plows. — Many men are working to improve the plow. There are two general kinds of plows, called moldboard plows and disk plows. Different kinds of plows are used for different kinds of land. They vary from heavy, wood plows to the light sod breaker with rods instead of moldboard, and from the simple disk plow to the heavy, deep tilling machine. Inventors are giving attention to rotary plows.

QUESTIONS

1. What results are obtained by plowing?
2. In your locality to what depth is the land plowed for each of the leading crops?
3. What is the effect of plowing when the soil is too wet?
4. Under what conditions is it well to plow the ground in the fall for crops that are planted in the spring?

LESSON IX

THE PLANT AND THE SOIL

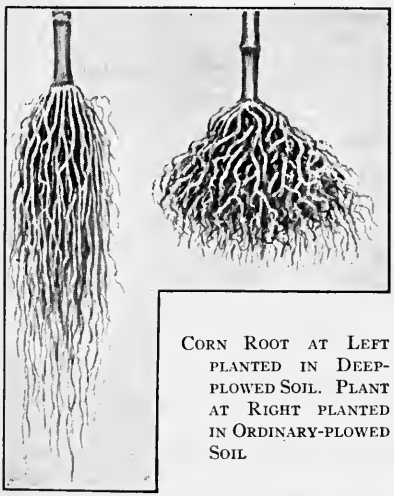
Roots are the parts of plants which grow in the soil. Just as stems grow upward toward the light, so the roots grow downward toward the moisture containing the food supply in the soil. Some plants like the common potato have underground stems; and a few plants like the peanut bear the fruit in the soil.

Work of roots. — The roots of plants serve two main purposes: (1) they absorb the moisture with the plant food dissolved in it; and (2) they anchor the plants to the soil and thus hold them in place. In many plants the roots serve as organs in which to store surplus food. These are of much importance to the farmer. Examples of such plants are sugar beets, cassava, sweet potatoes, turnips, carrots, and parsnips.

Kinds of roots. — Some plants have one main taproot growing straight down into the soil, the smaller roots coming out from this main root. Beets, clover, and alfalfa are some of the crop plants with taproots. In other plants the roots branch near the surface of the soil, as in many grasses.

How deep roots grow. — The depth to which roots grow in the soil depends upon the kind of plants and the condition of the soil. Buffalo grass in the West,

which grows only three or four inches high, is known to send its roots into the soil to a depth of seven feet. Alfalfa will send its taproot twenty feet or more into the soil unless prevented by layers of hard soil, rock, or water. In the desert, where the ground water is very far below the surface, and where the slight rainfall moistens the ground to the depth of only a few inches, the roots of desert plants grow only in this shallow layer of soil.



Corn Root at Left planted in Deep-plowed Soil. Plant at Right planted in Ordinary-plowed Soil

Kinds of soil. — Plants differ greatly as to the kind of soil in which they grow well. Rye will find plant food and grow on a soil that is too poor for wheat. Clay soils are well adapted to wheat and grass; while corn grows best in rich, dark loams.

QUESTIONS

1. What are the most important functions of roots?
2. What plants are called root crops?
3. What plants have long tap roots?
4. What conditions determine the depth to which roots penetrate the ground?

PRACTICAL EXERCISES

1. Lay a moistened piece of cloth or blotter upon a plate and place several seeds of radish or some other plant. Cover with another plate. In a few days look for the delicate root hairs on the roots of the germinating plants. All the food materials that plants take from the soil are absorbed by the root hairs.

2. Place a few grains of corn on a marble slab, and cover them with soil to a depth of one or two inches. After two weeks of growth remove the plants, and wash the marble to see how the roots have dissolved a little of the marble by the action of carbon dioxide which is excreted from the roots.

REFERENCE

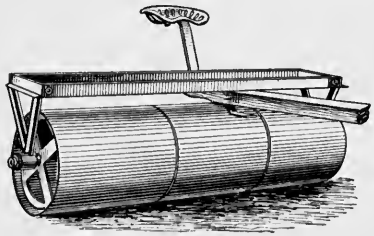
Farmers' Bulletins: 408, School exercises in plant production.

LESSON X

THE SEED BED

Making the seed bed. — After the land has been plowed, the next tillage operations are carried on to form the seed bed, which is the prepared soil in which the seeds are planted.

Much of the success of any farmer depends on his ability to make a seed bed suitable to the kind of crop he wishes to produce. Usually the first thing to do after plowing is to harrow the soil; and this harrowing should be done at the time the plowing is done, or at least the same day. There are many kinds of harrows; all of them are implements to scratch and break up the soil into fine particles.



ROLLER

Roller and harrow.— If a stiff sod has been turned over with the plow, and the weather is dry, a heavy roller may be run over the land to flatten the furrow slices, and pack them down so that the plants turned under will keep moist and decay more readily. If the top soil is dry, a roller is often used to pack the soil particles closer together so that the film water from

below can more readily move up into the seed bed. But since more soil moisture can thus reach the surface and then evaporate, the roller should be followed by the harrow to form a shallow mulch. If the weather has been wet and cold, and there is much moisture in the plowed soil, the roller will pack it down, and cause it to lose some of its moisture by evaporation. Some-

HARROW

times rolling the land helps the soil to warm up earlier in the spring.

Special seed beds. — Tobacco and some other plants have such tiny seeds it is difficult to make a proper seed bed in the field, so they are started in special seed beds; and the plants are afterward moved to the field. Tomatoes, cabbage, and celery require a long season in which to grow, and the seeds are first started in a hotbed or in a greenhouse. A hotbed is a seed bed having some arrangement for warming the soil from underneath, so the plants may be started

earlier in the spring than it would be safe to plant them in the open soil.

Make a good seed bed. — Much time, labor, and seed are lost by planting seeds on poorly prepared land. The best yield of a crop depends on the most perfect stand of plants in the soil. If the planted seeds do not grow, the farmer has lost not only his seed, but all the time and labor spent in preparing the soil, and he may lose the use of the land for the whole year.

Small seeds, such as wheat, clover, or alfalfa, usually grow better in a well settled and compact soil; while corn, potatoes, and peanuts do better in a loose seed bed.

QUESTIONS

1. What is a seed bed?
2. What are the conditions that make a good seed bed?
3. In your locality how is the seed bed prepared for wheat? How is it prepared for corn?
4. How is a hotbed made?

PRACTICAL EXERCISES

1. Fill two tin cans with the same kind of soil. Drive several small holes in the bottom of one can and plant seeds to the same depth in each. Add water to each can until the soil is saturated. Leave for several days. What is the effect of saturated soil upon seed germination? What necessary thing is excluded by the free water in the saturated soil?

2. Put clay soil into two flower pots and plant seeds of the same kind. To one pot add much water and thoroughly puddle the clay around the seeds. Moisten the soil in the other pot and keep it loose and mellow. What difference in plant growth do you observe?

LESSON XI

SEEDS

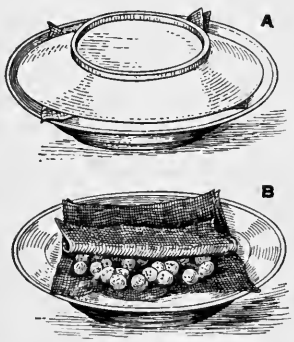
Contents of a seed. — Most farm plants are grown from seeds. A seed contains a tiny plant, called the germ or embryo, and a supply of food to nourish the little plant until it can send its roots into the soil and gather its own food. The seed is covered with a tough, hard coat to protect it from injury. Notice the skin of a bean and the shell of a squash or acorn. Sometimes the outer cover of a seed is thick and very hard, like that of the walnut or hickory nut.

Germinating Bean

Parts of a seed. — If you soak a bean for several hours, and then break the seed coat, you can readily see the main parts of the germ or embryo. Between the two halves of the bean is a little sproutlike body which is called the axis of the embryo. When the seed sprouts, one end of the axis grows downward and becomes a root, while the other end grows upward and develops into stem and leaves. At the end which

grows upward you will see a little bud made up of several tiny leaves. The two halves of the bean are the first leaves of the embryo and are so large because the reserve food supply is stored in them. These seed leaves are called cotyledons.

A grain of corn or wheat has one small cotyledon, and the food supply is not stored within the germ itself, but lies outside. You can easily remove the small germ of a grain of corn from the harder part of the seed which is the reserve food supply.



Seed Tester

Good seeds. — Good crops can be grown only from good seeds. As a rule, plump, heavy grains are good seed. The seeds of our crops keep their vitality for only a very few years, most of them only two years; and it is very important that the seed is not too old. Seeds keep best in a dry, airy, cool place.

Germination. — When seeds are placed in the ground, the warmth, moisture, and air of the soil cause them to germinate. At first, the plant lives upon the food supply stored in the seed, but, after a short time, the roots take in food material from the soil.

How to plant seeds. — The depth to which seeds should be planted depends on the kind and size of the

seed and the conditions of the soil. It is a general rule to plant seeds only as deep as is necessary to keep them in moist soil. Very tiny seeds are not covered with soil, but merely pressed into the soil and kept moist by frequent rains. Clover is usually sown by scattering the seed over the surface of the ground.

Quality of seeds. — In raising plants for seeds, we wish to make each plant produce as many perfect seeds as possible. Large beans produce only a few seeds on a plant, while the tobacco plant or a poppy may produce thousands of tiny seeds. In many farm crops each plant usually produces several hundred seeds. The number and quality of seeds from each plant depend largely on the fertility and depth of the soil.

QUESTIONS

1. What are the parts of a seed?
2. How does a grain of corn differ from a bean?
3. Of what use to the germinating plant is the food stored in the seed?
4. What three conditions are necessary to germination?
5. What things determine the depth to which seeds are planted?

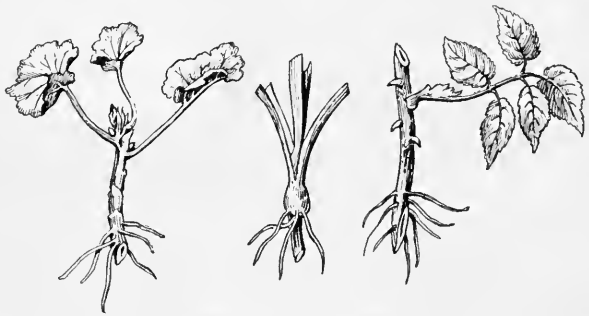
REFERENCE

Farmers' Bulletins: 428, Testing farm seeds in the home and in the rural school.

LESSON XII

GROWING PLANTS BY CUTTINGS, SCIONS, AND BUDS

CAN you name several plants which are not usually grown from seeds? What crop is obtained by planting underground stems? Can you name one or more house plants which are started by planting in the soil a leaf or branch from a parent plant? Do you know a tree

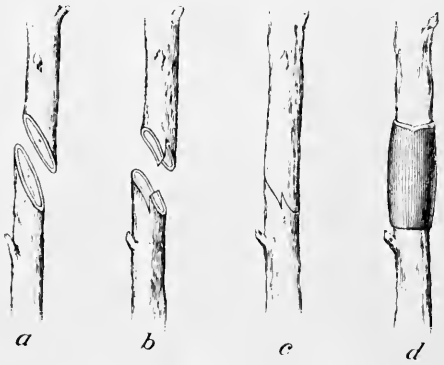


ROOTED CUTTINGS

which can be grown by planting twigs in the moist earth?

Cuttings. — With many crops it is far better to use cuttings instead of seeds to obtain the new plants. A cutting may be a leaf, or a piece of root or stem. If a leaf of a begonia or rubber plant is placed in moist

soil, it will develop roots and grow into a new plant. The crops of sugar cane are grown by planting the upper sections of the stem. The potato crop is grown by planting the tubers, which are underground stems. Hyacinths and tulips are also started from underground stems. Geraniums are grown by planting the green shoots or branches. In growing some plants the cuttings are made from twigs or small branches of mature or ripened wood. In starting willows and cottonwoods, the twigs of the previous summer's growth are used. Grapes and currants are also reproduced by cuttings of mature wood. The ends of black raspberry branches are bent down to the ground and covered with soil. Roots then form from the covered branches, and these rooted branches are cut and become new plants. Strawberries produce runners which take root at many places. These rooted parts become separate plants.

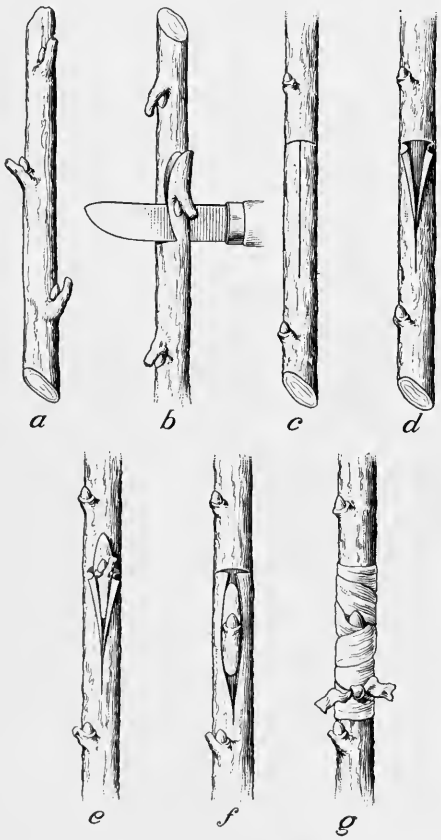


STEPS IN TONGUE GRAFTING

a, the two branches to be joined; *b*, a tongue cut in each; *c*, how fitted together; *d*, method of wrapping

There are many kinds of plants which send up new plants from the roots. If the plow cuts the roots of the black or yellow locust, the severed roots will send

up a number of young trees. The blackberry and the red raspberry are also examples of plants which reproduce themselves by root cuttings.



STEPS IN BUDDING

a, twig having suitable buds to use; *b*, method of cutting off the bud; *c*, how the bark is cut; *d*, how the bark is opened; *e*, inserting the bud; *f*, the bud in place; *g*, the bud properly wrapped

Grafting is another method of growing plants. A branch of mature or ripened wood with one or more buds attached, called a scion, may be cut from one tree and united with the root or branch of another tree called the stock. Many of our fruit trees are started in this manner. For example, in growing apple trees the scions from a tree bearing desirable fruit are grafted to the stocks of apple seedlings which have grown from apple seeds.

If the trees from the seeds were allowed to grow, the apples from such trees would be of poor quality and very different from the apples in which the seeds were produced. But by grafting to the seedling trees a scion from the tree we wish to propagate, we are sure to get trees which will bear the fruit we desire.

Budding is another form of grafting. A bud may be cut out of a plant and grafted on the stem of another plant, and from this bud will come branches which will bear fruit of the same kind as that of the plant from which the bud was taken. Peach and cherry trees are grown in this way. Some nurseries also start apple trees by budding.

By grafting scions or buds from several trees on the branches of one tree, we can get several varieties of fruit from the single tree. If a fruit tree bears an undesirable variety of fruit, we can change the fruit by grafting on it scions or buds from trees of desirable varieties.

QUESTIONS

1. What is a cutting? What plants are propagated by cuttings?
2. Why do we not raise apples from seedling trees?
3. What is a scion? Explain the method of grafting a scion to another plant.
4. Explain the method of budding.
5. What trees are propagated by grafting or budding?

PRACTICAL EXERCISES

1. Cut off the growing tip of a stem or branch of a geranium. Plant the cutting in moist earth, and after several days note the result.

2. Ask a fruit grower to show you how to graft a scion of one tree to the stock of another. Learn also to remove a bud and attach it to the branch of another tree.

3. Bend a long, slender branch of a black raspberry, grapevine, or rosebush to the ground and cover a section of it with four inches of soil. Leave above ground several inches of the tip of the branch. After the buried section takes root, the new plant may be severed from the old plant.

LESSON XIII

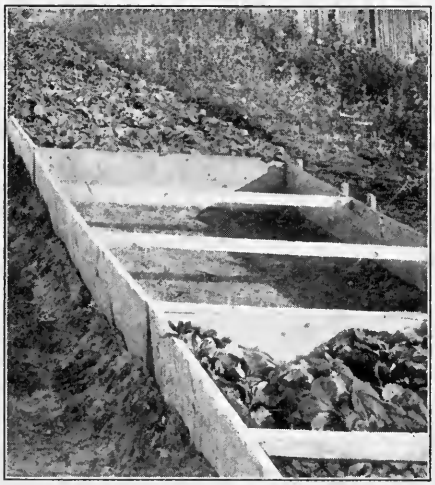
TRANSPLANTING

Planting indoors. — Doubtless you have seen your father or mother plant seeds in a box of earth, keep it in a warm place, and then when the plants were two or three inches high, remove them to the garden. The removal of plants from their place of early growth to a new soil is transplanting.

Hotbeds. — Farm plants which require a longer season than occurs in the north are raised by planting the seeds indoors or in hotbeds; and then setting them out when the danger of frost is over. It is desirable to have vegetables ready for market as early as possible, and so these plants are started indoors long before the weather outside is favorable to growth. When favorable growing conditions exist, the plants are then transplanted in the garden or field. Plants regularly raised in this way are tomatoes, cabbages, cauliflowers, peppers, egg plants, and celery. The young plants are grown two or three months indoors before they are removed to the open. Sometimes the young plants are

HOTBED

lifted when they get the second pair of leaves and planted in hotbeds, and from there they may be transplanted in cold frames, where they are allowed more cold air and light to harden them before they are transplanted in the field. Such plants may be transplanted two or three times. Celery is often transplanted twice.



Cold Frames

Advantages. — By growing young plants in greenhouses and hotbeds we can secure the most favorable conditions of soil, heat, moisture, and light. The soil and air can be artificially warmed; by screens the proper amount of light can be obtained; and the plants can be watered as often as necessary. To protect the young plants against disease, special chemical treatment can be given to the soil and the plants themselves to prevent the growth of dangerous bacteria. Loss by insects and other animals can be controlled or entirely prevented by these methods of early cultivation.

Nurseries. — In the case of tree seedlings a great saving of ground can be secured by having the young

trees grow for one, two, or three years in closely planted beds; and then transplanting them to the places where they are to grow. In the nurseries a few acres of seedling beds will grow trees enough to plant hundreds of acres; and while the young trees are in the nursery beds, the land to be planted in trees can be used for other crops.

Methods. — Transplanting is nearly always done by hand. But where the rows are far enough apart, and the plants are not to be placed close together in the rows, a transplanting machine may be used.

Plants set by hand are usually placed in holes made by a dibble, which is simply a round stick or flat piece of iron, used in one hand, while the plants are placed with the other hand. Then the soil is pressed against the roots with the dibble.

In transplanting it is always necessary to keep the roots moist and to protect them from injury. Whenever possible, it is best to have a ball of soil surrounding the roots. After transplanting, care must be taken to prevent much loss of moisture by transpiration, until the plant can get water from the soil by its root system.

QUESTIONS

1. What plants are usually started in hotbeds or in houses and then transplanted to the garden or field?
2. What results are gained by transplanting?
3. How does a cold frame differ from a hotbed?

4. Describe some method of transplanting you have seen.
5. What precautions should be observed in transplanting?

PRACTICAL EXERCISES

1. In a small box of earth, plant tomato seeds, and keep it in a warm room. At the same time make a number of small paper boxes, fill them with soil, and plant two or three tomato seeds in each. After the plants come up in the paper boxes, remove all but one from each box. At the proper time, plant the paper boxes in the ground without disturbing the tomato plant in each. Lift from the wooden box an equal number of tomato plants and transplant them in the usual way. Watch the results of each method of planting.

2. A simple hotbed is easily constructed by digging a hole in the ground two feet deep and fitting a frame of boards around it that will support a window sash. Fresh manure from grain-fed horses should be placed in a pile and water sprinkled over it until it is sufficiently moist. Then it should be forked over once or twice each day for a week or ten days to keep the manure from burning, and to set up active fermentation. Place this in the bed, pounding it down tight to a depth of twelve or fifteen inches. Cover with the sash and leave two or three days, testing the temperature with a thermometer, when the heat has gone down to 100 degrees, cover with four to six inches of good soil. In a day or two the heat will be reduced to 70 degrees or 80 degrees, and then the seeds may be planted. Ventilate carefully by opening the sash during the warm part of the day, and water to keep the soil moist. The sash should slope to the south; and if the sun is too bright, it may be shaded with a cloth or by whitewashing the glass.

LESSON XIV

SUNLIGHT AND PLANT GROWTH

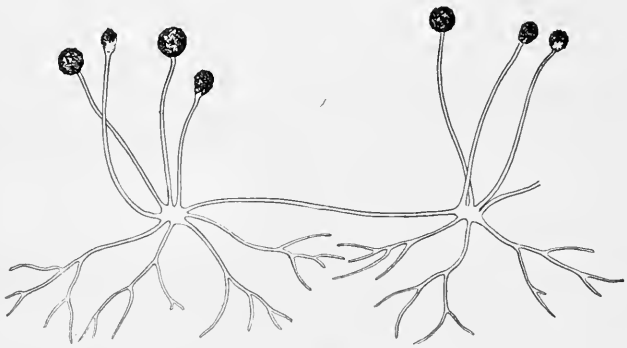
Root hairs. — After the seed has sprouted and the roots have become attached to the soil, the new plant must gather its own food materials and change them into its own substance. Plants can take in only such mineral matter as is dissolved in the soil water. Near the ends of the small roots are numerous hairlike cells called root hairs. These root hairs absorb the film moisture held around the soil particles. This moisture, containing very small amounts of the minerals of which the soil is composed, becomes the sap which passes through the root and stem to the leaves.

ROOT TIP

Sunlight. — Through the action of sunlight upon the green leaves, the materials from the soil and air are built into organic substances which finally become the tissues of the plant. Water and carbon are combined together in the leaves to form sugar. The carbon comes from the carbon dioxide which the plants take from the air. By other processes the sugar is combined with nitrogen, phosphorus, potassium, sulphur, and

other elements taken from the soil, and is finally converted into the actual substances of which plants are composed.

Photosynthesis. — This process of making sugar which takes place in the leaves during sunlight is called photosynthesis. Carbon dioxide, which is taken from the air into the leaves, is a gas composed of carbon and oxygen; and since only the carbon is used in the



Common Form of Mold (magnified)

process of photosynthesis, the oxygen is liberated and expelled into the air. This process of taking in carbon dioxide and throwing off the oxygen must not be confused with respiration of plants. Respiration goes on in plants as it does in animals. Both plants and animals in breathing take in oxygen from the air and expel carbon dioxide. But during the life of a plant more oxygen is given off to the air by photosynthesis than is taken from the air by respiration.

Growth without sunlight. — Some plants, like bacteria, molds, and mushrooms, do not have green matter; and these plants must live on ready-made food. Bacteria live in the bodies of plants and animals, and their food lies all about them ready to be absorbed. Molds live on plant and animal substances, such as bread, jelly, or decaying flesh. The mushrooms can grow only in soil rich in decaying plant and animal matter. Only green plants, which use the sunlight, can live on the mineral matter of the soil and the carbon taken from the carbon dioxide of the air.

The importance of sunlight is seen in the fact that the dried tissues of plants, like corn, wheat, or trees, are mostly carbon which came entirely from the air and was made part of the plant by the action of sunlight upon the green leaves. Only the ash of a burned plant is the material which came from the mineral matter of the soil.

Thus, in addition to soil, water, and air, the crops must have sunlight in order to grow and yield harvests for man.

QUESTIONS

1. What substance is manufactured in the green parts of a plant under the influence of sunlight?

2. What is the name of this building-up process? How does this process differ from respiration of plants?

3. What kinds of plants grow without sunlight? How do the food materials of such plants differ from those of green plants?

LESSON XV

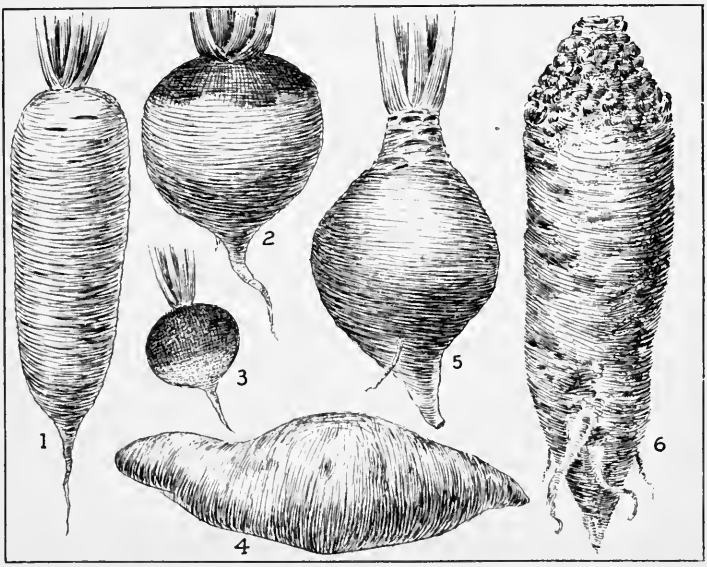
PLANTS GROWN ON THE FARM

Useful plants. — There are many kinds of plants useful to man. Most of the important crop plants are grown for food. Others are grown for the fibers which they yield. Trees are raised mainly for fuel and lumber. Some plants are grown for drugs and others for their beauty.

Grasses. — Most of the general farm crop plants belong to the grass family. The plants of this family, like wheat and oats, whose seeds are used for food, are called cereals. The seeds or grain of these plants are also called cereals. All of the cereals are grasses except buckwheat, which belongs to another family of flowering plants; but buckwheat is called a cereal because its seeds are used in making flour. Many of the grasses with fine leaves and stems are used for hay and pasture crops. The largest grasses used as crops in America are corn, sugar cane, and sorghum. The largest grass in the world is the bamboo, which is used for many purposes. Many important plants belong to the legume or pea family. Clover, alfalfa, peas, and beans are well-known legumes.

Food plants. — Corn, wheat, rice, barley, rye, oats, and buckwheat are crops whose seeds or grains are

used as food for men and animals. The hay and pasture grasses are grown to supply animals with food. Some food plants are raised for their roots, like sweet potatoes, beets, carrots, parsnips, radishes, and turnips. The common potato and the Jerusalem artichoke, al-



ROOTS USED AS FOOD

1, carrot; 2, turnip; 3, radish; 4, sweet potato; 5, rutabaga; 6, mangel-wurzel.

though underground stems, are classed as root crops. We eat the leaves of lettuce, cabbage, celery, and spinach, the leaf stalks of rhubarb and chard, and the stems of asparagus. Sugar cane is grown for the sugar which is obtained from the juice of the stem. Tea is the dried leaves of a shrub grown in distant lands, while coffee

is the berry of a pulpy fruit which grows on shrubs in tropical regions. Many plants are raised for their fruit, like berries, apples, peaches, figs, oranges, and dates.

Fiber plants. — The most important fiber plant in the world is cotton; and the United States is the greatest cotton-growing country. Other fiber plants are flax and the hemps. While the mulberry tree does not yield fibers, yet its leaves are the food of the silk-

Cabbage Lettuce Spinach

LEAVES USED AS FOOD

worms that spin the silk fibers which are woven into silk cloth.

Useful trees. — Trees yield wood which is used for fuel and lumber. Some also furnish nuts which are used for food. From the pine trees we get turpentine and tar; and from the rubber tree is obtained a gummy sap which is manufactured into rubber. Trees are also grown to protect crops and buildings against winds and to prevent erosion by running water. Many kinds of trees are planted for their beauty.

Drugs. — Another group of plants furnishes drugs. Most of these drugs are used as medicines. A few,

like tobacco and opium, are used by a large number of people, not as foods or medicines, but to satisfy a desire for these products.

CELERY

Flowers and ornamental shrubs are grown for their beauty. On many farms there could well be given more attention to the growing of such plants in order to increase the attractiveness of the home surroundings, and thus increase the happiness of the people living on the farm.

Rotation of crops. — A farmer usually raises more than one kind of crop. To get the most out of the soil

and keep up its fertility, the general farmer practices rotation of crops. Instead of raising the same crop on the same land each year, he follows one crop with a crop of another kind. This is called rotation of crops.

One crop may improve the soil for another kind of crop. The legume plants often enrich the soil by adding nitrogen which is taken from the air by the bacteria which form nodules or tubercles on the roots of these plants. A rotation of crops is usually planned to have the land in clover, alfalfa, or some other legume crop for one or more years; then a cultivated crop like corn or potatoes is grown for one or two years; and then a grain crop for one or two years, after which the land is again seeded to another legume crop. Each crop is called a course, so if three crops are used, the plan is a three-course rotation. If a farmer plows under a clover sod for corn, then follows with wheat, and again with clover, he is using a three-course rotation.

QUESTIONS

1. What crops are raised to produce food for man?
2. Make a list of food products for man that are grown in your vicinity. In what form do they appear as food?
3. What are the most important fiber plants of the world? What is the most important fiber crop of the United States?
4. What are the most useful timber trees?
5. What crops are raised mainly to furnish food for animals?
6. What are cereal crops?

LESSON XVI

POWER ON THE FARM

Sources of power. — In olden days most of the work on the farm was done by man power. The muscles of men and women were used to hoe the

Method of harvesting in the Olden Days

ground, cut the grain and hay, and carry the harvests to the shed or barn. Although our modern methods of farming require more power than ever before, yet the farmer is using less of his own muscular power.

Draft animals, engines, wind, and water do the work for him.

Draft animals. — The most common draft animals are horses and mules. Oxen are used in some parts of our country and in some other countries. Other draft animals used in different parts of the world are elephants, buffaloes, reindeer, camels, and dogs.

The horse and the mule are raised for power purposes alone; and in many of our states the value of horses and mules is much greater than that of cattle and hogs. If you think of the work of raising our draft animals and the amount of land and time that is given to crops which are grown for their food, you will realize the large cost of power upon the farm.

Engines. — Threshing and grinding machinery is usually run by engines that use steam, gasoline, or kerosene. If these engines travel by their own power, they are called traction engines or tractors. Often the land of large farms is plowed by using these traction engines to pull the plows. Several furrows are plowed at a time by the use of gang plows in which there are several moldboard plows or disks fastened together. With one team of horses and a single plow, a man can plow only an acre or two in a day. If he uses four horses and a two-gang plow, one man can break up from two to six acres per day. But with large plows and engines he can plow twenty to forty acres of land in one day. As a man's time is worth more than the time of a horse or a machine, there is economy in using

more power to do the work in the shortest possible length of time.

Small gas engines are becoming very important on farms to furnish power for many things that were formerly done by hand. Windmills are often used as

Traction Engine at work on a Farm

power to drive pumps and other small machinery. By placing the wind wheels on top of high towers, a stronger wind can be used to turn them than if they were placed near the ground.

Water power. — It is very likely that in the future water power will be used to do much of the farm work. By the use of dynamos the power of the falling water

of streams can be turned into electric energy, which by wires can be carried to the electric motors on the farms.

QUESTIONS

1. In ancient times what was the main source of power used in farming?
2. What are draft animals? Name several draft animals.
3. What animals are raised in this country for power?
4. What farming operations require a large amount of power?
5. What are some of the advantages of using engines for power on the farm?
6. For what purposes are windmills used?
7. How may streams be used to furnish power for farms?

REFERENCES

Farmers' Bulletins: 277, Use of alcohol and gasoline in farm engines; 394, Use of windmills in irrigation in semiarid West.

LESSON XVII

HARVESTING CROPS

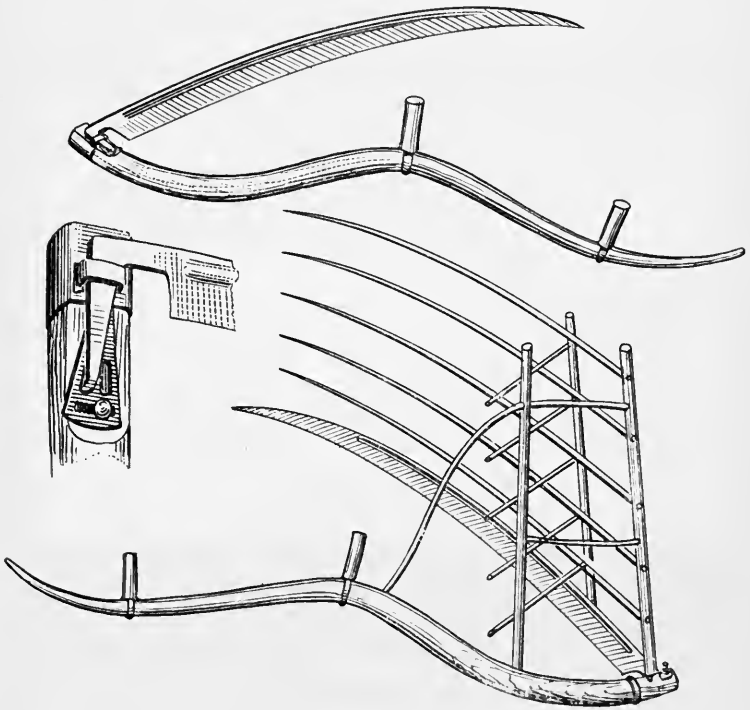
The time of harvest depends mainly on the kind of crop and the use made of it. If corn is grown for the mature grain, the harvesting takes place in the fall after it is thoroughly ripe. If it is grown to be used as a vegetable, it is gathered while the grains are still soft and milky. Oats grown for the grain are cut after the seeds are nearly mature, while if grown for hay, they are cut while the stems and leaves are green and before the seeds have developed much. Pears are much better if picked green and allowed to ripen in storage, and winter apples will ripen after they have been picked. Some fruits, however, cannot be picked while green. If grapes are picked while they are green and sour, they will never get sweet.

Hay and grain. — In the greater part of our country the hay and grain harvests come close together, and this season is usually the busiest time of the year. Most of the grain crops must be harvested just before the seeds are fully ripe. If the harvest is delayed too long, the grains of wheat, oats, and barley will drop from the heads to the ground. The kernels of corn are tightly fastened to the cob and protected by the

HAY RAKE

husk, and, for this reason, corn may be left in the field for a long time after it ripens in the fall.

Machinery. — There has been a wonderful change in the possibilities of farming by the invention of har-

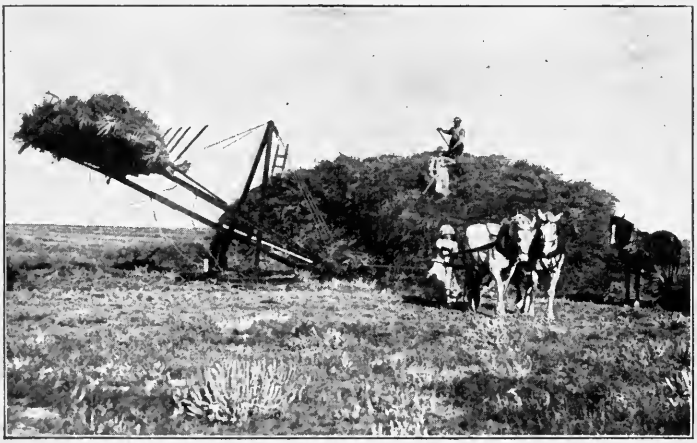


Scythe and Cradle

vesting machinery. When the farmer had to gather his wheat by hand with a sickle or a cradle, he could raise only a few acres, for if he raised more, a large part of the crop would become over-ripe, before it could be

harvested, and the heads would shatter and allow the grain to fall to the ground. Now, with the harvester or self-binder a very large crop can be harvested in three or four days.

The stems and leaves are the most valuable parts of plants grown for hay; and if a crop is allowed to go



Hay Stacker

to seed, the leaves become too dry and the stems too hard and woody to make good hay. Most hay grasses and clovers are therefore harvested when they come into bloom. Alfalfa has the most nutrition in the stems and leaves when the buds are first formed, and before they get into full bloom. Thus hay making must be done in the few days when the crop is at the proper stage for making good forage; and the use of

machinery for harvesting hay has greatly increased the acreage of hay crops.

Hay is cut with a mowing machine that can mow from five to ten acres in a day. When the hay is partly dry, it is raked into windrows in which the drying and curing continues. In wet countries where the hay does not readily dry out, before raking it is turned and stirred with a machine called a hay tedder. From the windrows the hay is pitched upon wagons with large hayracks and taken to the barn or stack. On some farms the loading and unloading are done by machinery. If the hay is stacked in the field, it is moved to the stack by means of sleds or drags. Very often, the hay in the windrows is gathered into small piles or haycocks and allowed to cure for several days before storing it in a stack or barn. In the haymow or stack the hay goes through a final curing process that makes it crisp, palatable, and nutritious. Good, well-cured hay should have all the leaves on it, should be light in color, free from dust and mold, and have a clean, sweet smell.

QUESTIONS

1. Why is the harvest season usually the busiest time of the year?
2. What good results have come from the use of harvesting machinery?
3. What was the old method of harvesting wheat?
4. How is hay harvested?
5. What qualities should hay possess?

PRACTICAL EXERCISES

1. Write a composition on the development of harvesting machinery from the reaping hook to the self-binder, and illustrate with pictures that you have collected of harvesting machinery.
2. Explain how wheat or oats is thrashed.

REFERENCES

Selected Readings: Scythe Song, — Andrew Lang; The Solitary Reaper, — William Wordsworth.

LESSON XVIII

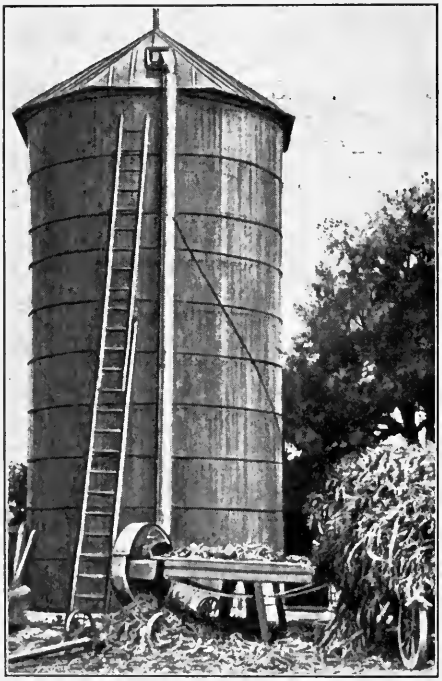
FORAGE CROPS

Three kinds of crops. — The crops used as food for animals are classed into (1) grain crops, (2) forage crops, and (3) root crops. By some people the root crops are called forage.

Forage includes hay, pasture grass, silage, and fodder. In addition to these common kinds of forage, many other plants serve as forage crops. The forage plants of greatest importance are those used for hay, — timothy, clover, alfalfa, and millet. In the United States the two most important hay crops are timothy and clover. Sometimes the plants which are usually grown for grain are cut while green, and are harvested and fed like hay.

Silage. — If forage plants are placed while green in nearly air-tight pits or vats, they will keep fresh for a long time and can be fed as green forage to the farm animals. Forage thus kept is called silage, and the buildings in which it is stored are called silos. Corn is the chief silage crop, but clover, sorghum, millet, peas, and beans are sometimes used for silage. At beet-sugar factories, the beet pulp from which the sugar has been extracted is stored in silos and fed to

cattle. Corn intended for silage is cut while green, and the stalks, leaves, and ears are packed in the silo. In some of the Northern states where the growing season is too short for the corn to ripen well, much of it is harvested while green for silage. Silage cannot be shipped from the farm and fed to animals in other sections, but must be fed on the farm where it is stored.

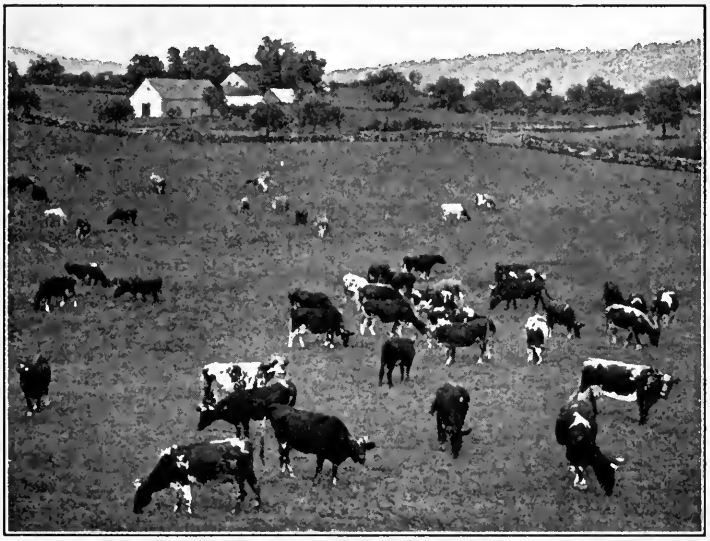


A Silo

Fodder. — The dried stalks and leaves of corn and sorghum are called fodder. After the grain is thrashed from wheat, oats, and other small grain crops, the straw is used as forage. Oats straw is a forage of relatively high value. Coarse forage, such as fodder and straw, is spoken of as roughage or stover.

Grazing. — Farm animals secure a large part of their forage foods by grazing. There are many pasture grasses, and nearly all of the hay grasses also serve

for grazing purposes. Kentucky blue grass is the most important pasture grass. Several plants belonging to the mustard family, such as cabbage and dwarf rape, are used as pasturage crops, being used for feeding hogs and sheep. In the Western grazing states very



Cattle Grazing

much of the forage comes from wild grasses. In the Southwest, the cactus is used to some extent as a forage for cattle; but the spines must be burned off before the animals can eat this plant. Mr. Burbank has introduced some kinds of cactus that have no spines, and these are relished by stock.

Forage crops are important farm products in all

sections of the country, but in certain sections, hay and pasture are the leading crops. Many of the forage plants serve a double purpose, that of yielding valuable food crops and increasing the fertility of the soil.

QUESTIONS

1. What is a forage crop?
2. What crops are used for forage in this country? In your community?
3. What is silage? What crop is most generally used for silage?
4. What are some of the leading pasture plants?
5. What straw has high value as a forage?

PRACTICAL EXERCISES

1. Write a good description of a silo.
2. Make a collection of forage grasses. Several stems of each, with the leaves and flowers, should be tied together and the bunch neatly labeled.
3. Explain the process of cutting corn; baling straw.

REFERENCES

Farmers' Bulletins: 66, Meadows and pastures; 102, Southern forage plants; 271, Forage crop practices in western Oregon and western Washington; 300, Some important grasses and forage plants for Gulf Coast region; 312, Successful Southern hay farm; 362, Conditions affecting value of market hay; 402, Canada blue grass, its culture and uses; 483, The thornless prickly pears; 508, Market hay; 509, Forage crops for the cotton regions.

LESSON XIX

TIMOTHY AND CLOVER

Timothy. — In value and acreage, timothy is the leading hay crop of the United States. It is the most extensively used hay for feeding horses, and is in great demand by teamsters and liverymen. For this reason, a large part of the timothy crop is shipped from the farms to the cities.

Timothy

Timothy is a grass with fine leaves, slender stems, and long heads filled with many small seeds. It grows straight, is easily cut, dries readily, and is free from dust. The seed is usually sown in the fall, and yields a crop the following summer. In hilly sections of the country where hay is the chief crop, many fields are kept in timothy for several years, the fertility of the soil being kept up by adding fertilizers.

Timothy and clover. — While the acreage of timothy is far greater than for any other single hay crop, yet the acreage of timothy and clover mixed is larger. This

White Clover

grass and legume together form a hay of great value for general feeding purposes. The timothy may be sown in the fall and the clover added to it in the spring; or both, in the spring, may be sown in wheat or oats. After the nurse crop of wheat or oats is harvested, the young clover and timothy serve as pasture. The mixed hay crop of the following summer will be largely clover, but the second hay crop will be mostly timothy.

Importance of clovers.—The clovers are of special importance because they not only furnish a food of great fattening value, but enrich the soil by tak-

Red Clover

ing in nitrogen from the air in the soil. Because of the fertilizing value of clover, it is the forage crop which is most often used in rotation plans.

Kinds of clover. — A true clover has each leaf made up of three leaflets, and the flowers are grouped together in bunches or heads. There are four kinds of clover grown by farmers. These are red, crimson, white, and alsike clovers. The red, crimson, and alsike clovers are used for hay and pasture. Crimson clover is also frequently used as a cover crop for orchards. The white clover is used for pastures and lawns. Red clover is by far the most important of the clovers. A number of legumes, as sweet clover, Florida clover, beggarweed, and Japan clover are called clovers, but they are not true clovers.

The crimson clover is an annual plant, therefore the seed must be sown every year. Red clover is a biennial plant; that is, it lives for two years; but under favorable conditions it may live longer. Some of the clovers are perennial, living several years.

Clover grows best on good, well-tilled, and sweet soil. Sometimes acids sour the soil; and clover will not grow until lime has been added to destroy the acid and thus sweeten the soil.

QUESTIONS

1. What is the leading hay crop of the United States?
2. What qualities of timothy make it a good hay?
3. Why is clover of such great importance to the farmer?

4. What are the classes of true clovers?

5. What is a rather common cause for repeated failures to get a stand of clover on some fields? What is the remedy?

PRACTICAL EXERCISES

1. Obtain specimens of timothy and the most common kinds of clover. Study the roots, stem, leaves, flowers, and seed of each plant. In digging, get all the root system, if possible.

2. Look for nodules on the roots of these plants. Can you find any on the roots of timothy?

3. Explain the process and machinery used in mowing and stacking hay.

REFERENCES

Bulletins on clover and timothy published by the Agricultural College and Experiment Station in your state. Farmers' Bulletins: 123, Red clover seed, information for purchasers; 260, Seed of red clover and its impurities; 323, Clover farming on sandy jack-pine lands of the North; 455, Red clover; 485, Sweet clover; 502, Timothy production on irrigated land in the Northwestern states.

LESSON XX

ALFALFA

Alfalfa is a legume. — The flowers grow in little spikelets or clusters from the axils of the leaves on the upper part of the stem. The taproot of alfalfa grows deep into the soil and lives many years. It is said that fields of alfalfa in Spain have lived one hundred and eighty years from one planting. In western America there are fields forty or fifty years old. On some soils alfalfa may live only a few seasons.

The word *alfalfa* comes from an Arabic word which means the *best fodder*. The plant is a native of Asia and was brought to Greece and Italy many centuries ago. In some places, alfalfa is called lucerne, which is the name of a valley in Italy, from which place it was taken to all parts of Europe.

Effect on the soil. — Alfalfa is now grown in all parts of the United States and in Canada. It is one of the most useful, most profitable, and most highly prized crops. It is not only a valuable hay and pasture crop, but also an improver of the soil in which it grows. The soil in which alfalfa has grown for a few years is so rich that it will produce large yields of other crops.

Large crops. — Alfalfa gives the largest yields of any hay plant. It furnishes two crops a year in the northern

part of the country where the growing season is short, and as many as eight crops a year where the climate enables it to grow almost the whole year. It yields from three to eight tons per acre of hay in a year.

Alfalfa Plants

Bacteria needed.—This crop prefers deep, sweet soils. It is especially suited to arid regions, where it is easily raised by irrigation. Sometimes the bacteria which live on the roots and gather nitrogen from the air are not present; and if this is the case, the soil should be inoculated with the nitrogen-fixing bacteria. This is usually done by taking soil from an alfalfa field where the bacteria are present, and scattering it over the ground to be inoculated.

Seeding.—Alfalfa is grown from seeds. Most of the seed comes from dry regions where alfalfa growing is an important branch of farming. The seeds are small, so there should be a well-prepared seed bed that is well pulverized, free from weeds, and compact. The seeds may be sown broadcast, but better

results are obtained when they are planted with an alfalfa drill that scatters the seeds evenly in rows seven or eight inches apart. If a seed crop is to be grown, the seeds should be spread far apart, using two or three pounds of seed per acre. The best hay is from fields with a thick stand of plants, and for a hay crop from ten

Cutting Alfalfa

to twenty-five pounds of seed per acre are sown. Alfalfa is sown in the spring or summer, and where conditions are favorable, the seed may be sown with a grain crop.

Harvesting. —The young alfalfa plants should not be cut too soon after they begin growing, or before they begin to branch by throwing out new stems from the crowns of the roots. When raised for hay, alfalfa is

cut with mowing machines. Alfalfa for seed is harvested with a reaper or binder or with a mowing machine that has an attachment for bunching the crop.

Value. — Alfalfa is one of the best foods in the world for stock. It is used mostly for hay, but it makes excellent pasture for horses, sheep, swine, and poultry. It is one of the best soiling plants. In many localities the hay is ground into meal, which can be fed without waste. The young plants are sometimes boiled and eaten as greens. Bees make fine honey from the blossoms of alfalfa.

QUESTION

1. Why is alfalfa such an important forage crop?
2. What kind of soil is best for this crop?
3. How is alfalfa sown and harvested?
4. In what sections of the country is alfalfa the leading hay crop?
5. What is the common cause of failure to get a good stand of alfalfa? What is the remedy?

PRACTICAL EXERCISE

1. Dig up an alfalfa plant, getting as much of the roots as possible, and study the parts of the plant. Are there nodules on the roots? How does alfalfa differ from clover?

REFERENCES

Bulletins on alfalfa published by the Agricultural College and Experiment Station in your state. Farmers' Bulletins: 194, Alfalfa seed; 339, Alfalfa; 373, Irrigation of alfalfa; 495, Alfalfa seed production.

LESSON XXI

MILLET, SORGHUM, AND OTHER FORAGE CROPS

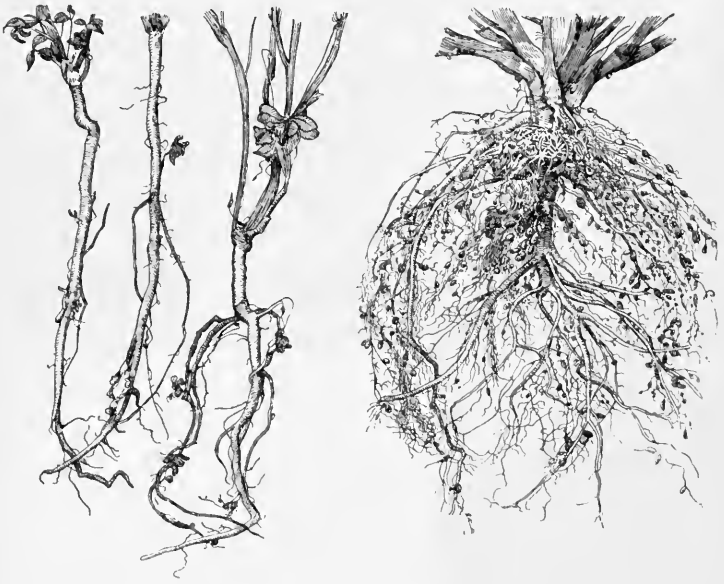
The millets are cereal grasses whose seeds are extensively used as human food in parts of Asia. In this country the millets are grown mainly for hay. The crushed seeds are used to some extent as food for stock. The three millets most generally grown in the United States are the common millet, Hungarian millet, and German millet. These grasses make quick growth and come to maturity in a shorter time than most grasses, and for this reason they are called short season crops. The seed is usually sown in the spring, but may be sown in midsummer.

The sorghums are grasses which are grown in this country mainly for forage, while in parts of Africa and Asia the seeds form an important food for man. The principal kinds of sorghum are sweet sorghum, Kafir corn, milo maize, Jerusalem corn, and broom corn. The sweet sorghum is grown for the molasses, which is made from the sweet juice of the stem. The sweet sorghum is also used for fodder and silage. Broom corn is grown for the tassels from which brooms are made. The Kafir corn, milo maize, and Jerusalem corn are tropical or subtropical plants, and are able

A Field of Millet

to live in hot, dry climates. These plants are grown for fodder and also for the seed which is being used as food for stock.

Sorghum may be sown broadcast and the crop harvested the same as hay; or it may be planted in



Nodules on Alfalfa Roots and Red Clover Roots

drill rows or hills and cultivated and harvested the same as corn.

Root nodules. — Like clover and alfalfa, peas, beans, vetches, and lentils are legumes, and have nodules on their roots which are produced by the nitrogen-gathering bacteria. The value of these plants in enriching

PEA PLANT

the ground with nitrogen has led to their use as forage crops in regular rotation courses.

Peas require a cool climate and moist soil in order to yield the best crops. The pea vines are cut with mowing machines, or with reapers that pile them in bunches. The crop may be used as hay or silage.

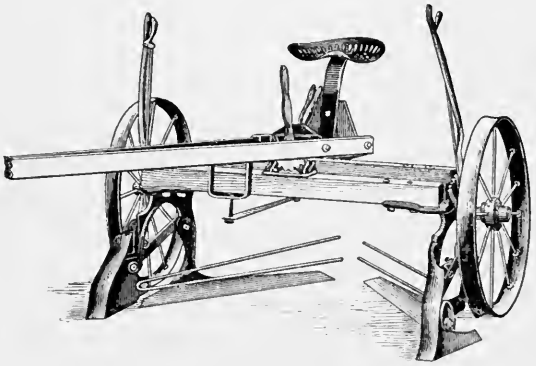
The cowpeas are a kind of bean widely grown in the Southern states. They make a valuable hay crop and also improve the soil for other crops. Soy beans are grown to improve the soil and also for hay or silage.

BEAN PLANTS

As forage crops, both cowpeas and soy beans are nutritious foods for live stock.

The vetches are slender climbing plants which are grown to plow under as a green manure, and as pasture and hay plants.

Peas, beans, and lentils have been grown for centuries for food for man. Peas and beans are common



Bean Harvester

garden crops and in some sections are grown as field crops for market purposes. The pea vines are cut and hauled to the canning factories, where there are threshing machines which thresh out the green peas and separate them into different sizes for canning. The vines are used for forage. The beans are planted in rows or hills like corn, and harvested with a bean cutter, or pulled by hand, and are threshed like other seeds by tramping or pounding or by bean threshers. The bean straw is used as forage for sheep and cows,

and the best beans are used as human food, while the inferior grades are fed to animals. Lentils have two small, lens-shaped seeds in each pod. They are grown only to a very small extent in this country.

QUESTIONS

1. What is the chief use of millet in Asia?
2. What is the principal use of millet in this country?
3. What are the most common kinds of millet?
4. What sorghum plants are raised in this country?
5. In addition to clover and alfalfa, what other leguminous plants are raised for forage?

REFERENCES

Farmers' Bulletins: 101, Millets; 164, Rape as a forage crop; 224, Canadian field peas; 278, Leguminous crops for green manuring; 318, Cowpeas; 322, Milo as a dry-land crop; 372, Soy beans; 441, Lespedeza, or Japan clover; 515, Vetches.

LESSON XXII

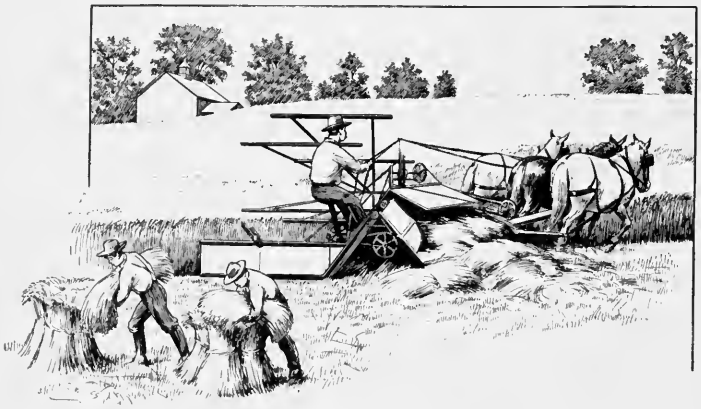
WHEAT

Kinds of wheat. — Bread is the "staff of life," and wheat bread is the most important food of the leading nations. It contains so much of the nutritive elements needed by man that it is almost a perfect food. There are many kinds of wheat. Einkorn, spelt, emmer, durum wheat, composite wheat, Polish wheat, and common wheat are some of the most important types. Common wheat, the most extensively grown of the wheats, is divided into spring wheat, and winter or fall wheat. Spring wheat is sown in the spring, while the winter or fall wheat is sown in the autumn.

Wheat Plant

Manner of growth. — From a central stem beneath the ground several tillers or shoots grow into stems. Thus a single grain produces several stalks of wheat, while a grain of corn produces a single stalk. The roots of the wheat are many and fibrous, and the stems are

jointed and hollow between the joints. The lower parts of the leaves are wrapped around the stems, while



HARVESTER

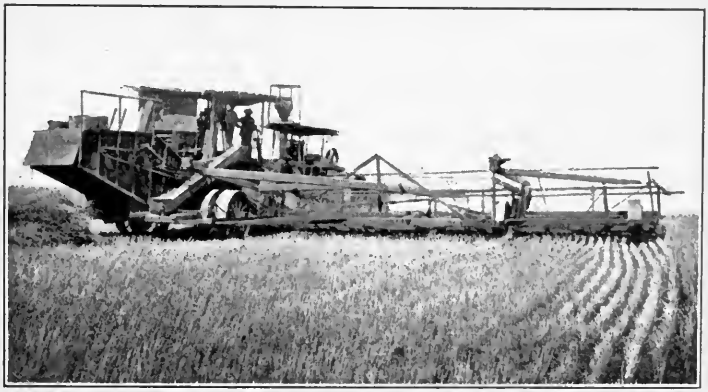
the upper parts are long, narrow, pointed blades. The head or spike at the top of the stem contains many spikelets, each containing one to five seeds. As there are many spikelets on each head and many tillers or stems from each seed, one plant may bear many hundredfold.

Farmers raise usually from ten to thirty bushels of wheat per acre, although sometimes as much as seventy bushels per acre is grown on good soils that are well farmed.

Soil. — Wheat does best on light clay and loam soils. The seed is usually planted with a drill in rows a few inches apart. In most states the farmer sows about one to one and a quarter bushels of seed wheat

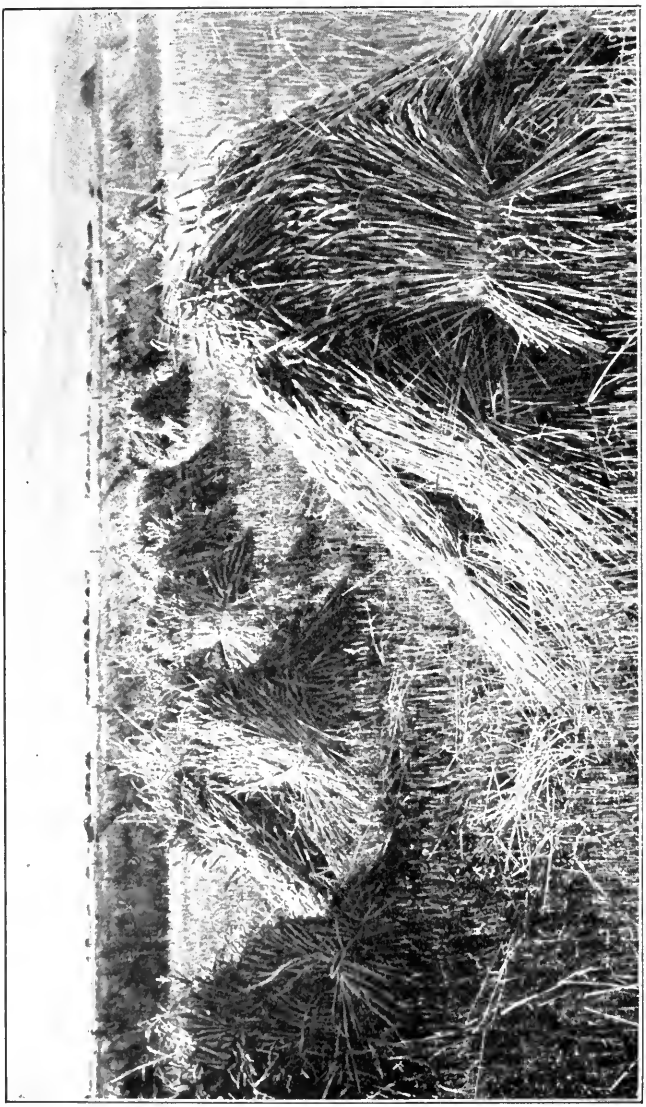
per acre. The wheat field may be harrowed to stir the ground before the plants have grown high enough to be injured; but usually no cultivation is given to the wheat. When grown by irrigation, wheat is generally flooded with water from one to five times during the growing season.

Harvesting. — Wheat is harvested with a self-binder or harvester which cuts the wheat and binds it into bundles or sheaves. Several bundles are placed together in shocks or stooks. When dry, the sheaves are hauled to the threshing machine, or placed in stacks and threshed a few weeks later. Sometimes wheat is cut with heading machines or strippers, from which the wheat heads go direct to the thresher.



Reaper and Thresher

Threshing. — The threshing machine separates the grain from the chaff and straw. Fifty years ago wheat



Field of Wheat in the Shock

was threshed with a flail or tramped out by animals. We now have threshing machines or separators run by engines which thresh many thousands of bushels in a day. On very large farms a combined reaper and thresher is used, that cuts from twenty to forty acres of grain a day and at the same time threshes and sacks it ready for market.

Einkorn, spelt, and emmer are types of wheat which are like oats, in that the hull adheres to the grain, while in common wheat the grain is free from the husks which held the grain before threshing. With the exception of emmer, these grains do not promise to become very important in American agriculture.

Emmer is not subject to some of the plant diseases that affect other kinds of wheat. It is also a drought-resistant crop and therefore grows better in dry regions than other forms of wheat. For this reason it is becoming an important crop in dry farming.

Emmer is planted and grown like wheat. It is threshed in the same way, except that the kernels are not separated from the hulls. The grains are rich in minerals, protein, and starch; and in parts of the world, emmer is an important food for man, being used as a breakfast food. In the time of the Romans it was ground into flour for bread. It is a valuable food for stock. The hull on the grain has some value in stock feeding; it makes the animal chew the grain to get the flavor of the kernel, and thus helps digestion.

QUESTIONS

1. What are the leading kinds of wheat?
2. What soils are well adapted to wheat growing?
3. In what respects does emmer differ from common wheat?
4. What are tillers?
5. What is the average yield of wheat in your locality? What are some of the highest yields?
6. What are some of the common causes of low wheat yields in your section?

PRACTICAL EXERCISES

Write a short composition on the growing of wheat in your locality. Give the methods of preparing the soil, sowing the seed, and harvesting the crop.

Find the average yield per acre of wheat in the United States and in the leading wheat countries of the world.

Make a collection of the most important kinds of wheat. Each sample of grain may be kept in a small bottle.

Plant several grains of wheat in a can or pot of earth. At the end of one week remove two or three of the sprouting grains. How many temporary roots are there? Make a drawing of the young plants at this stage. A week later remove two or three other young plants and note the growth of permanent roots. Make drawings. Examine others at intervals of one week to note the growth of tillers.

REFERENCES

Write to your Agricultural College for bulletins on wheat growing.

Farmers' Bulletins: 132, Principal insect enemies of growing wheat; 139, Emmer, a grain for semiarid regions; 466, Winter emmer.

LESSON XXIII

CORN

Importance of corn. — In acreage and value, corn is the most important crop of the United States. Although grown in every state, yet more than half of the corn crop is raised in the seven states of Illinois, Iowa, Missouri, Nebraska, Indiana, Kansas, and Ohio. The United States produces about three times as much corn as the rest of the world; but corn is not an important export of this country, for most of it is fed to cattle and hogs. The meat of these animals, however, is one of our leading exports.

Soil and climate. — The main geographic factors in the growth of corn are soil and climate. Clay loams and silt loams are good corn soils. The silt loams of river bottoms are especially adapted to corn growing. Corn requires a large amount of humus, which is added to the soil by stable manure and legume crops. The summers must be hot, with warm nights, much sunshine, and of sufficient length that the corn may ripen before frost. The most common cause of low yields of corn is a shortage of rain during the growing season. A crop needs from ten to fifteen inches of rain pretty evenly distributed through the season. The moist soil of

river valleys is another cause of the high yield of river bottoms. During droughts that seriously affect the crop on uplands, the corn on bottom land has sufficient moisture.

Plowing. — Most of the land for corn is plowed in the spring, although a considerable acreage is plowed in the fall. The best time to plow depends on the character of the soil, lay of the land, climate, and previous crop. The seed bed should be deep and well pulverized. In a stiff clay corn should be planted one inch deep, and in open, dry soils it should be planted three or four inches deep. In some places where the ground is dry on top, the corn is often planted in the bottom of furrows made by a lister. The time of planting varies with locality and season.

Corn in Shocks

Planting. — As a rule, corn is planted just as soon as the ground is warm and the danger of frost is over. Since it is so often true that early planted corn gives the best yield, it is desirable that the preparation of the ground be sufficiently advanced, so that planting

may be done as soon as the ground and air are warm enough.

Cultivation. — Shortly after the corn is planted, the cultivation begins and is continued until the corn is so large that the horses and cultivators cannot pass through the fields without injuring the corn. Be-

Corn Cultivator

fore the corn is up, or while it is quite small, the crop may be given the first cultivation by harrowing. The other cultivations are done with corn cultivators that stir the soil to a depth of from one to three inches, to kill weeds, and save moisture. During the dry weeks of the summer it is very important that a mulch of fine soil be kept to reduce the evaporation of soil moisture. After each summer rain the ground should be given another plowing to form this soil mulch and thus save the moisture for a possible drought.

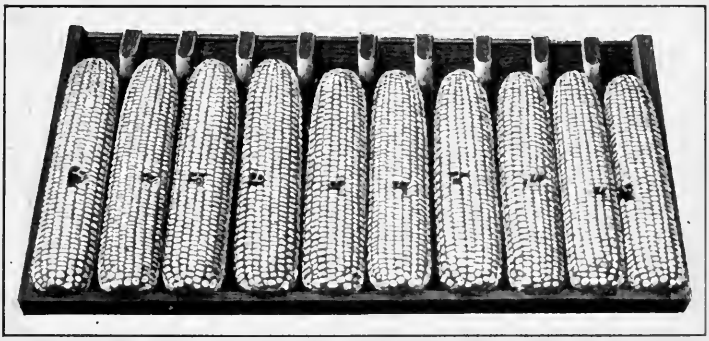
Harvesting. — The corn crop ripens in from three to five months. Roasting ears may be ready for use in

Corn Field with Ripe Corn

less than two months. The corn crop is harvested in two or three different ways. The most common method is to husk the ears from the standing stalks, which are left in the field and pastured by the live stock during the winter months. Another method is to cut the cornstalks by hand or with a corn-harvesting machine and then place the fodder in shocks. Later in the season the ears may be husked by hand from the fodder, or the fodder may be run through a corn shredder that husks the corn and then shreds the stalks, leaves, and husks into small pieces, which are stored in barns for forage. On many farms where there are large

numbers of live stock, the corn is cut while green and put into silos and fed as silage.

Uses of corn. — All parts of the corn plant, except the roots, are utilized. The stalks, leaves, and husks form good forage, while the grain is the best stock food in the world. A small percentage of corn is used in making alcohol and spirituous liquors. The part of the grain left after it is malted is used for stock food. Corn oil is made from the germs or embryos of corn. Cobs are used for fuel, and the pith is used for packing. Corn is also an important human food. Many of the breakfast foods are made wholly or partly of corn. Hominy is the corn kernels with the outer skin removed. Corn starch is made from the starchy part of the grain. Sweet corn and pop corn are grown only for human food.



Ears of Corn selected for Seed

Seed corn. — The selection, storage, and testing of seed corn is a very important part of corn culture. In

the early fall, before husking time, the farmer should go through his fields and select the very best ears for seed. They should be stored in a dry place that is well ventilated, and where mice and rats cannot molest. Seed corn should never be stored in boxes, barrels, or sacks. In the spring, five grains from each ear should be put in germinating boxes in order to test the vitality of the seed. Ears of corn whose grains do not all sprout or do not show a vigorous growth should be rejected.

The average yield of corn for the whole country is about twenty-four bushels per acre, but good farmers often grow more than one hundred bushels per acre. In a few cases about two hundred bushels per acre have been raised. From eight to fourteen tons or more of green plants per acre may be grown for silage, and from two to two and one half tons of dry plants or fodder.

QUESTIONS

1. What do we mean by "corn"? What is meant by the same word in Eastern countries? Why is it sometimes called Indian corn?
2. What are the leading corn states of the United States?
3. What kinds of soil are best for corn?
4. What climatic conditions are most favorable for corn?
5. How did the pioneers manage to grow it in the woods?
6. What is the most common cause of poor corn crops?
7. What are the main objects of corn cultivation?
8. In what different ways is corn harvested?

9. What is the most important use of corn? Name other uses.

10. Although corn is our leading crop, why do we export so little?

PRACTICAL EXERCISES

1. On a plate put a moist cloth or piece of blotting paper. Place several grains of corn on the moist surface, and cover with another plate. Keep in a warm place and observe from day to day the germination of the corn. Note the root hairs. How many temporary roots are there? Make drawings of a germinating grain at different stages of growth.

2. In a tall bottle or glass jar of soil, plant five grains of corn at each of the following depths: one, two, four, and six inches. Keep the soil moist, but not too wet. Observe from day to day the growth at each depth. Note the growth of temporary and permanent roots. How long does it take for the plants to come up from each depth? Which plants are the strongest?

3. In order to test seed corn, a germination test should be carried out. Procure a box two or three inches deep, two feet wide, and two and one half feet long. Across the top of the box stretch wire or twine to divide the space into two-inch squares, and then fill the box with sand to the level of the wire or twine. Six kernels from each numbered ear of corn are to be placed in a square having the same number as the ear.

Take the kernels from different parts of an ear, but not from the base nor tip. The kernels should be pressed into the sand, but not completely buried. Moisten the sand and cover with glass or other suitable material. Keep in a warm place, at a temperature of about 70 degrees. If all the grains from an ear do not send out vigorous root and stem sprouts within four or five days, the ear should not be used for seed corn.

4. Write to the Agricultural College in your state for the score card used in judging seed corn. Bring to school ten ears

of the best corn you can find, and use the score card in judging this corn. If possible, an expert corn judge should correct your estimates.

REFERENCES

Write to your Agricultural College for bulletins on corn growing.

Farmers' Bulletins: 32, Silos and silage; 81, Corn culture in the South; 229, Production of good seed corn; 253, Germination of seed corn; 292, Cost of filling silos; 298, Food value of corn and corn products; 303, Corn-harvesting machinery; 313, Harvesting and storing corn; 325, Small farms in corn belt; 400, More profitable corn-planting method; 409, School lessons on corn; 414, Corn cultivation; 415, Seed corn.

Selected Readings: The Corn Song, — J. G. Whittier; Maize, — William W. Fosdick; Blessing the Cornfields (Hiawatha), — Longfellow.

LESSON XXIV

RICE

Rice an important food. — Rice is a cereal grass, the seeds of which are used for food by two fifths of the people in the world. The rice plant, like the wheat, produces many stems from one seed, but the heads bearing the seeds form a loose, nodding spray with only one seed in a place.

Where grown. — Rice is a tropical and semitropical plant growing in lowlands which can be flooded at certain times, for rice is the only crop that grows for the greater part of the time in water. Rice is grown in the southern part of the United States. Louisiana, Texas, and Arkansas are the leading rice states.

Method of planting. — Rice is planted in the spring, from March to May, and harvested in the fall from August to October. There are two ways of preparing the land for growing rice. It may be plowed and harrowed under the water, or the seed bed may be prepared in dry ground. The seed is sown broadcast or drilled in rows twelve or eighteen inches apart. From one to three bushels of seed are sown per acre. The rice fields have dikes or little dams built around them to hold the water, and after the seed is planted the fields are flooded with water, which remains on the

land for five or six days to sprout the seed. The water is then turned off and the plants allowed to grow until they have two leaves. Then the land is again flooded, covering the little plants about six inches. This irrigation lasts about twenty days or a month, when the

A Field of Rice

water is turned off, and the rice is allowed to grow for a month or so, when the fields are again flooded and the plants left standing in the water from about June to August, or until the crop is full grown. The water is drained off, so that the crop will ripen and the ground dry out for harvesting.

Harvesting. — The rice is cut with a sickle, or a harvesting machine. It is threshed with the same machine that is used for threshing other small grains. The yield per acre is from ten to twenty barrels of 160 pounds each. The rice grains from the thresher are covered with husks, and are called rough rice or paddy. The rice is then taken to mills which remove the husks and polish the grains. This polish or glossy finish is put on by running the rice through cylinders lined with soft sheepskin.

Cooking. — Rice is usually cooked by boiling, or it may be puffed by machinery and used as a breakfast food, or as a confection, like popcorn. It is used in the manufacture of starch and is also used as a malting grain for making beer. Poorer grades are used for stock food. Rice straw is coarse and of little value, except to plow in the soil as a fertilizer.

QUESTIONS

1. In what countries is rice the chief food of the people?
2. What are the leading rice states of the United States?
3. How is rice cultivated? How is it harvested?
4. After harvesting, what changes must rice undergo before it is ready for the table?

REFERENCES

If you live in a rice-growing state, obtain from the Agricultural College bulletins on the growing of rice.

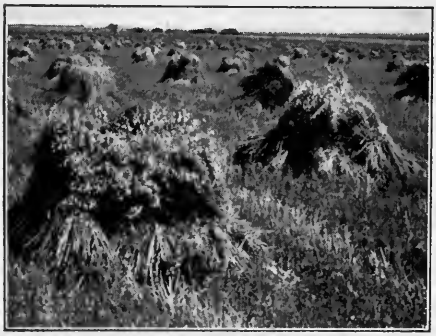
Farmers' Bulletins: 110, Rice culture in the United States; 417, Rice culture.

LESSON XXV

OATS

Two uses. — The oat is a cereal grass that is grown for grain or hay. If it is raised for the grain, it is harvested and threshed like wheat. If the crop is to be used as hay, it is cut while green and harvested like the common hay crops. Oat hay is more nutritious than timothy hay.

Manner of growth. — The seeds are borne at the top of the stem in a spray or panicle somewhat like rice.



Oats in Shock

The plants branch or tiller at the bottom like wheat, producing many stems from a single seed. Nearly all kinds of oats that are commonly grown have the kernels tightly inclosed in the hulls. There are hull-less oats which shell out when they are threshed. The two great classes of oats are the bush or spreading oats, and the side or mane oats. In the bush oats the

HARVESTING OATS

small branchlets in the head which bear the seeds spread out in every direction. In the side oats the branchlets are all on one side of the head like the mane of a horse or a banner in the wind.

Oat Panicles

Planting. — Winter oats are planted in the fall and harvested the following summer. Spring oats are planted in the spring and are grown in the Northern states, where the winters are too cold for oats sown in the fall.

Oats like a cool climate and moist soils, so they are sown in the spring as early as possible. The seeds may be planted from one to five inches deep, but they do better when planted shallow. From one to three bushels of seed per acre are either sown broadcast or with a drill, like wheat. It is always better to sow the seed with a drill, so that the grains are evenly scattered in the row and covered with soil.

Oats as food. — Oats are considered the best of all grains for feeding horses, and they are also good for other kinds of stock. For human food the hulls are taken off the grain by machinery, and the kernels are

ground or rolled into oatmeal that is used as a breakfast food and other food articles. Oatmeal is one of the chief foods of Scotland.

QUESTIONS

1. What are the chief uses of oats?
2. How does oat hay compare in nutritive value with other forage crops?
3. Are oats grown in your locality? If so, what methods are used in raising this crop?
4. Under what climatic conditions will oats thrive?

PRACTICAL EXERCISES

1. Make a careful study of a head of oats. How does it differ from a head of wheat? Make drawings.
2. Collect samples of fine grades of oats. Keep them in bottles properly labeled.
3. Plant twenty or thirty grains of oats. At the end of one week dig up a few of the grains and note the temporary roots. How many are there? A week later dig up other plants and note the growth of permanent roots. Allow the others to continue growing, and watch the development of tillers or new stems. Make drawings.

REFERENCES

Farmers' Bulletins: 395, Sixty-day and Kherson oats; 420, Oats, distribution and uses; 424, Oats, growing the crop; 436, Winter oats for the South.

LESSON XXVI

BARLEY

Many kinds. — Barley belongs to the same general tribe of grasses as wheat and rye. Most of the barleys have the grain tightly inclosed in thin hulls, and a long beard at the tip of each kernel. There are several hundred kinds of barley, with greater variation in the character of the grain than any other cereal.

Barley Plant

Range of climate. — Barley is grown in more parts of the world than any other kind of grain. It will mature in the far north, where the undersoil remains frozen during the summer; and it will grow well in the far south. Barley will stand more drought and mature more quickly than other grains, but when the plants are small they are easily injured by too much wetness or dryness. The crop requires a rich soil and a well-prepared seed bed. About one and one half bushels of seed are sown to the acre.

Harvesting. — The grain should be quite ripe before it is cut. It is harvested with a self-binder and threshed with the common grain-threshing machine. Barley yields from thirty to forty bushels or more per

Field of Ripe Barley

acre. Barley in the hull weighs about forty-eight pounds per bushel.

Uses. — This plant is supposed to have come from western Asia. For many hundreds of years, it was the grain from which civilized man made his bread. In

modern times, wheat has become the most important bread-making cereal, and barley is but little used for human food. About the only form in which barley is now used as human food is the pearl barley used in soups. This is made by taking the hulls off the kernels with special machines. The principal uses of barley are as food for stock and as malt for beer. As a stock food, barley is very nutritious and is almost equal to corn. It may be fed whole or ground into meal. The hull-less barley is so hard that it must be ground or soaked before it is fed.

Malt. — In making beer the barley is malted by germinating the grains. In the sprouting grains the starch is changed to sugar, which is then dissolved out of the grain by soaking in water. After the sugar has been dissolved, the sprouted barley grains, called malt sprouts, are sold for stock food.

QUESTIONS

1. What are the most important uses of barley?
2. What are the leading barley states of the United States?
3. Is barley adapted to a narrow or wide range of climate?
4. What are the leading barley countries of the world? (See Yearbook of Agriculture.)

PRACTICAL EXERCISES

1. Plant grains of barley and make a study of the young plants, similar to the study of wheat and of oats. How many temporary roots do you find? Usually barley has five tempo-

rary roots. Note the development of permanent roots and tillers. Make drawings.

2. Make a careful study of a head of barley. Draw.

REFERENCES

Farmers' Bulletins: 427, Barley culture in Southern states; 443, Barley: growing the crop; 518, Winter barley.

LESSON XXVII

RYE

A hardy cereal. — Rye is more closely related to wheat than to other cereals. The seeds are longer and more nearly round than wheat seeds. The straws or stems are longer, tougher, and more slender than wheat. Rye usually lives only one season, but sometimes the roots will live more than one year and produce two or more crops with one planting. There are two kinds of rye — winter or fall rye, and spring rye. Compared with other grains, there are few varieties of rye. It is a very hardy plant and may be grown in almost any climate, and it is an important crop in far northern countries. It will grow on poorer soil and stand more neglect than other cereals; but, to secure the highest yield, it needs good soil and care. Rye does not yield such heavy crops of grain as barley.

Rye Plant

A good crop, however, produces twenty to thirty bushels per acre. A bushel of rye weighs fifty-six pounds. From fifty to seventy-five pounds of seed are sown per acre.

Uses of the straw. — Rye is grown extensively in parts of Europe for bread. In this country it is raised chiefly for the straw, which, if well grown and cared

Field of Rye in the Shock

for, is worth as much per acre as the grain. Rye straw is more prized than any other as bedding for horses and other stock. It is also used to manufacture hats, mats, and lemonade straws. One company in New York buys each year more than $25,000 of rye straw to make lemonade straws. To save the straw, it is tied in straight bundles, and these are bound together in bales to be sent to market. A good yield is a ton

of straw per acre. Rye is often grown for hay and pasture, and also as a crop to plow under to improve the fertility of the soil.

Uses of the grain. — The rye grain is tough, and harder to grind than other grain, and is not liked so well by stock as other grains. Rye is better for swine than for other stock. Distillers buy a part of the grain crop for the production of alcoholic liquors. After fermentation has converted a part of the starch and sugar into alcohol, the refuse is fed to stock. Rye is also used to make breakfast foods.

QUESTIONS

1. How does rye differ from wheat?
2. What uses are made of rye?
3. What are the leading rye countries of the world? (See Yearbook of Agriculture.)
4. Is rye grown in the section of country in which you live? If so, what farm methods are used in raising this crop?

PRACTICAL EXERCISES

1. Obtain one or more samples of rye and add to your collection of grains.
2. Make a careful study of a head of rye. Compare it with the heads of other grain plants.
3. Plant several grains of rye in a pot of earth and study the young plants at different stages of growth. How many temporary roots are there? Note the growth of permanent roots and tillers.

REFERENCES

If you live in a state that raises a considerable quantity of rye, write to your Agricultural College for bulletins on this crop.

LESSON XXVIII

COTTON

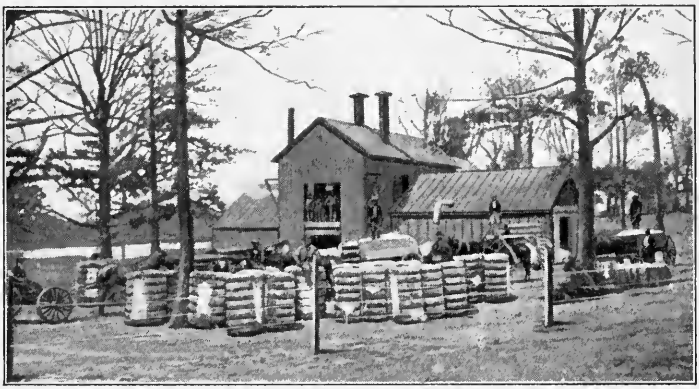
An important fiber. — Cotton is raised for the long fine hairs or fibers, called lint, which grow on the seeds of the shrubby plant. The fibers are used to make clothing; and cotton is the most important fiber

Cotton Field

crop in the world. Cotton grows in hot, moist, fertile regions. Our Southern states form the cotton belt of the United States. In these states, cotton is the

most important crop; and this section produces about two thirds of the entire cotton crop of the world.

Planting. — Cotton is grown in a three-course rotation, with a grain crop and cowpeas or clover as the two other crops. The seeds are planted in drill rows or hills, much as corn is planted, using one to three bushels of seed per acre. After the plants come up,



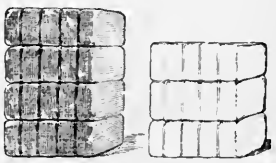
Cotton Gin and Compress

they are thinned with a hoe by chopping out the plants not wanted, leaving one plant in a place, from twelve to twenty inches apart. The crop is given a shallow cultivation with a kind of shovel plow called a sweep which kills weeds, keeps the soil loose, and saves the moisture.

Picking cotton. — When the seed pods or cotton bolls burst open and expose the white masses of fibers, the cotton is picked by hand. One person can pick

from 100 to 500 pounds in a day. All the pods do not ripen at once, and it usually requires about four months to harvest the crop.

The fiber and the seed. — After the cotton is picked, it is hauled to the gin and compress. The cotton gin removes the seeds from the fibers and the cotton is pressed into bales of about 500 pounds each. A good yield of cotton is from one to one and one half bales per acre. Before the cotton gin was made, women and children spent their evenings picking the cotton off the seeds by hand; and between supper and bedtime, each was expected to pick enough to fill one of his shoes with the seeds. This would give about four pounds of separated cotton. The cotton gin made possible the growing of this crop on a large scale, just as the reaper made it possible to grow large crops of wheat, oats, and other cereals.



Cotton Products of United States and Rest of the World

Kinds. — There are two kinds of cotton grown in the United States. The sea-island cotton has the longest, toughest, and finest fiber; while the upland cotton has shorter fibers, but the bolls are larger and produce more cotton. There are two kinds of upland cotton, — the long staple and short staple varieties. The upland cotton is the kind more generally cultivated, while the sea-island cotton is grown on the coast plain of South Carolina, Georgia, and Florida.

The seed. — Cottonseed oil manufactured from the seed is perhaps the most profitable part of the crop. About forty gallons are obtained from one ton of seed, when it is put under high pressure. The cottonseed oil is used for human food, and for making soap. The seed cake, which is left after the oil has been pressed out, is ground into cottonseed meal, which is a valuable food for stock, and also a soil fertilizer.

QUESTIONS

1. What is the rank of the United States as a cotton-producing country?
2. Where is the cotton belt of the United States?
3. What climatic conditions are required by cotton?
4. What kinds of cotton are grown in the United States?
5. What methods are used in planting, cultivating, and harvesting cotton?
6. What products are made from the seeds of cotton?
7. What important historical effect resulted from the invention of the cotton gin?

PRACTICAL EXERCISES

1. Secure a branch of a cotton plant, with one or more bolls attached; secure also samples of cotton, cotton cloth, cottonseed oil, and cottonseed meal.
2. Germinate a number of cotton seeds and make a study of the young plants.

REFERENCES

If you live in a cotton state, write to the Agricultural College in your state for bulletins on cotton growing.

Farmers' Bulletins: 36, Cotton seed and its products; 47, Insects affecting cotton plant; 48, Manuring of cotton; 217, Essential steps in securing an early crop of cotton; 285, Advantage of planting heavy cottonseed; 286, Comparative value of whole cotton seed and cottonseed meal in fertilizing cotton; 290, Cotton bollworm, summary of its life history and habits; 302, Sea-island cotton, its culture, improvement, and diseases; 314, Method of breeding cotton to escape boll-weevil damage; 326, Building up run-down cotton plantation; 364, Profitable cotton farm; 512, The boll-weevil problem.

LESSON XXIX

FLAX, HEMP, AND OTHER FIBER PLANTS

The flax plant. — All of you have seen linen; but how many of you have seen the plant from which come the fibers that are woven into linen cloth? Do you know that linen and linseed oil are products of the flax plant? The fibers come from the stems, and the oil is pressed from the flax seed. In the days of the pioneers each family grew a patch of flax to furnish the linen fibers which were spun and woven into homemade cloth.

You have likewise seen twine and rope, made of hemp and other fibers; but not many of you have seen the plants which furnish these fibers.

Flax and hemp are important fiber crops, but they are not grown extensively in the United States. In Europe flax is grown mainly for its fiber, but in the United States it is grown chiefly for the oil. As cotton is our most important fiber plant, and also yields oil, so flax is our most important oil plant, and also yields valuable fiber.

Planting. — Flax is an annual plant, always grown from the seeds which are sown broadcast or with a drill, like other small grains. It is planted in the

spring, after danger of frost is over. Where grown for the seed, from fourteen to twenty pounds of seed are sown per acre; and where raised for the fiber, about forty pounds per acre are sown broadcast in order to make the plants grow straight and tall. Flax will grow in almost any kind of soil, but rich soils are required to produce large yields of fiber and seed.

Field of Flax

Harvesting. — The crop matures in about one hundred days from the time of sowing. It is usually harvested with a reaper, leaving the bundles without tying, or tying and standing them in loose shocks to dry out before threshing.

Uses of the seed. — After the linseed oil is pressed from the seed, the oil cake made of the crushed seeds is used as food for stock. This oil cake or meal is one of the most important stock foods, furnishing both

nitrogenous matter and fat to the animals. The main use of linseed oil is for mixing paints.

The fiber. — The flax fiber is separated from the woody part of the stems by soaking the straw in water for one or two weeks, or until the stems are soft. This softening of the straw by moisture is called retting. When the retting process is complete, the straw is taken from the water and spread out to dry, after which it is put through machines which break the stems and separate the fibers.

HEMP

Where grown. — Flax is grown mainly in the Northwestern states. North Dakota, South Dakota, Minnesota, and Montana are the leading states in flax production. In the states named it is often raised as the first crop on plowed sod land.

Hemp yields a soft fiber from the inner bark of the

stem. The raising of this crop is confined mainly to Kentucky and Missouri; and it is generally known as Kentucky hemp. The plant is an annual which grows about ten feet in height, and is raised for both the fiber and seed.

Uses of the seed. — The seed is used for bird and poultry food, and in the manufacture of oil for paint. When grown for the seed, hemp is planted and cultivated in hills, like corn. When grown for the fiber, the seed is sown with a wheat drill, sowing both ways and using about a bushel of seed to the acre.

Planting and harvesting. — In Kentucky, hemp is sown about the 25th of April and is ready to cut about the 1st of September. It is usually cut by hand close to the ground in order to get the whole length of the stems. After cutting, the stalks lie in the field for a week or more to dry out, after which they are tied into small bundles and set up in shocks. The fibers are loosened from the stalks by spreading the hemp on the field and leaving it for one or two months in winter so that the moisture and frost will act on it. The process of breaking the straw and separating the fiber is usually done by hand. The fiber is used in making burlap, twine, and carpet.

Twine. — A very large amount of binder twine is used in harvesting the enormous grain crops of the United States. Most of the binder twine is made from the henequen which is grown in Cuba and southern Mexico. The fibers come from the long bayonet-shaped

leaves of this plant. The abaca, a plant with large leaves growing in the Philippine Islands, furnishes the Manila hemp which is also extensively used for binder twine. Ropes also are made from these fibers.

Jute is a valuable fiber plant, raised mostly in India. It is used for making rope and coarse fabrics. In the Philippines a variety of pineapple is grown for the fibers in the leaves which are woven into cloth. Coconut fiber is used for making ropes and sailcloth. Raffia is the coarse fiber from the leaves of a palm tree.

QUESTIONS

1. What is the name of the cloth that is made of flax fibers? What part of the flax plant is used to make fibers?
2. Besides the fiber, flax yields what other important product?
3. What are the leading flax states of the United States?
4. How is the flax crop grown?
5. What products are obtained from the hemp plant?
6. What fiber plants are grown in tropical countries?
7. What two plants furnish nearly all the fibers for binder twine?

PRACTICAL EXERCISES

1. Obtain samples of tow from flax and hemp, sisal and Manila hemp, and cloth made from the fibers of flax, hemp, and jute.
2. Crush a flaxseed on a sheet of paper and note its oily character. Examine samples of linseed oil, flaxseed meal, and oil cake.

REFERENCES

Farmers' Bulletins: 274, Flax culture.

Yearbook of Agriculture: 1911, Fibers used for binder twine, pp. 193–200.

LESSON XXX

SUGAR PLANTS

Sugar is found in all plants and in all parts of plants. It is found in the sap of trees and grasses, in the roots of many plants, and gives sweetness to fruits and seeds.

Sugar Cane

Sugar plants are those which have so much sugar stored in parts of them that it may be extracted at a profit. Honey plants are those that have sweet nectar in the blossoms, which is used by the bees to make honey. Sugar cane, sugar beets, sweet sorghum, and maple trees are the sugar plants which are raised by farmers to furnish sugar and sirup.

Sugar cane is one of the most important crops in many of the hot regions of the world. Louisiana is by far the leading sugar state of our own country. Large quantities are grown in Hawaii, Cuba, Porto Rico, India, and Java. The sugar cane is a giant grass, which sometimes grows thirty feet high. The sugar is manufactured from the cane stalks after the leaves and tops have been removed.

Planting. — The plants are propagated by planting the upper part of the stems which have buds that grow into new plants. These pieces of stems for planting

Field of Sugar Beets

are called seed cane. The soil should be plowed deep for cane, which is planted in rows or hills, like corn, and cultivated the same as for corn, until the cane plants

are large enough to shade the ground. The growing of the sugar cane crop requires a large amount of hand labor. The planting, the stripping off the leaves, and the cutting of the cane stalks are done by hand.

Raw sugar. — After the cane is cut, it is hauled to the mills, where the juice is pressed out of the stems and then boiled in vacuum pans until the crude or raw sugar is obtained. The raw sugar is then shipped to refineries, where it is changed by a number of complicated processes into refined sugar.

Sweet sorghum contains much sugar in the juice and is used for the manufacture of sirup and molasses. Sugar can be made from sorghum sirup, but this is not done in the United States.

Beet sugar. — During the last few years sugar beets have supplied nearly half of the world's sugar supply. The leading countries in the production of beet sugar are Germany, Russia, and Austria-Hungary. In the United States the sugar beet is grown in the Western and Northern states. Colorado, California, and Michigan are the leading states in the yield of beet sugar.

Sugar beets are raised from the seed, which is sown with drills in the spring. The rows are about twenty inches apart, and the small seeds are sown close together, using about twenty pounds of seed per acre. After the plants come up they are thinned out until they stand eight or ten inches apart in the rows. The soil is tilled with horse cultivators, which work two to four rows at a time. The sugar beets ripen in September

or October, and are then plowed up with a special beet plow. The tops are cut off, and the roots are sent to

Beet Sugar Factory

the factory. From fifteen to twenty-five tons of beets form the usual yield per acre.

Maple sugar. — The delicious maple sugar is made from the sap of the sugar maple and red maple trees. Early in the spring, when the sap begins to flow, the trees are tapped by boring a hole in the trunk and

putting in a spout called a spile. A bucket hangs from the spile and catches the sap as it runs out. The maple sap, which contains about 3 per cent of sugar, is boiled down into a thick sirup or made into sugar.

A cheaper sirup is made from glucose, which is manufactured from corn starch; and this has largely taken the place of the better kinds of sirup on the market.

Gathering Maple Sap

QUESTIONS

1. What are the two most important sugar plants? Name others.
2. What are the leading sugar-producing countries of the world?
3. What methods are used in growing sugar cane?
4. What are the main steps in the manufacture of cane sugar?
5. How are sugar beets raised?

6. What states of the United States lead in the production of sugar beets? What is the leading sugar-beet country of the world? (See Yearbook of Agriculture.)

PRACTICAL EXERCISES

1. If you live where sugar cane is raised, write a composition on the growing of this crop.

2. If you live where sugar beets are raised, write a composition on the growing of this crop, and the manufacture of beet sugar.

3. Explain the process of making maple sirup, if you live in a section of the country that produces this article.

REFERENCES

If you live in a state that raises sugar cane or sugar beets, write to your Agricultural College for bulletins on sugar cane or sugar beets.

Farmers' Bulletins: 52, Sugar beet, culture, seed development, manufacture, and statistics; 93, Sugar as food; 252, Maple sugar and sirup; 477, Sorghum sirup manufacture; 517, The production of maple sirup and sugar.

LESSON XXXI

POTATOES

Seed potatoes. — The potato is the most important of the so-called vegetables. Potatoes are classed as a root crop although they are really underground stems. In the underground stem, called tubers, the plants store up starch in a form that is good to eat. The true seeds of the potato plant are borne in seed-balls at the top of the stems. These seeds are used only in breeding work to produce new varieties of potatoes. The eyes on potatoes are buds which grow, when planted, and produce new potatoes like the kind planted. Seed potatoes should be selected from the most prolific hills; they should be true to type and free from any appearance of disease. The seed potatoes may be planted whole, or they may be cut into pieces before planting, each piece having one or two eyes.

Potato Plant with Tubers

Planting. — Potatoes are raised in crop rotations of alfalfa or clover and small grains as the other two crops. They do better in a cool climate; and contrary to

general belief, they will grow with less moisture than many other crops. They are planted in the spring, in rows about three feet apart and from eight to eighteen inches apart in the rows. They usually do best on a well-drained, deeply tilled, mellow, and rich loam soil.

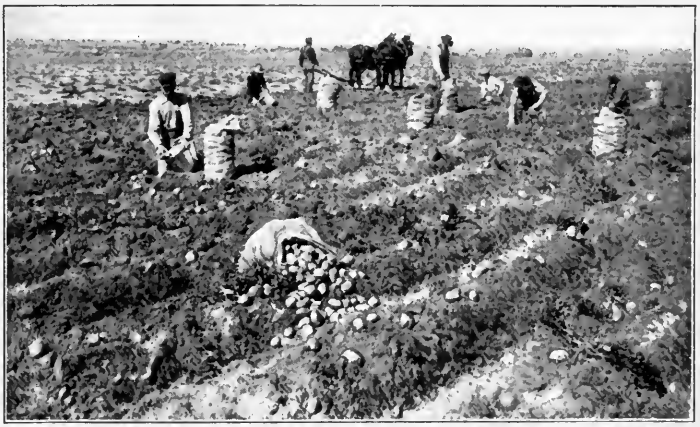
Potato Digger

They are planted by hand or with a potato planter and covered about four inches deep. The soil is kept well stirred until the plants are too large for the cultivator to pass between the rows without injuring them. In the fall when the potatoes are ripe, and before danger of freezing in the ground, they are dug with a potato fork or with a potato-digging machine. They are then picked up, sorted, and sacked for market. Potatoes are kept through the winter by being stored in cellars, where they are safe from freezing.

Varieties. — There are many varieties of potatoes, differing in color, shape, table qualities, and time of planting. The two great classes, depending on the time of planting and harvesting, are early potatoes and late potatoes.

Uses. — The great use of potatoes is to serve as a food for man. They are also used as a stock food and for the manufacture of starch and alcohol. The vines are of no value except to be plowed into the soil to increase its fertility.

Sweet potatoes. — In the South sweet potatoes are an important crop. In the North they do not thrive

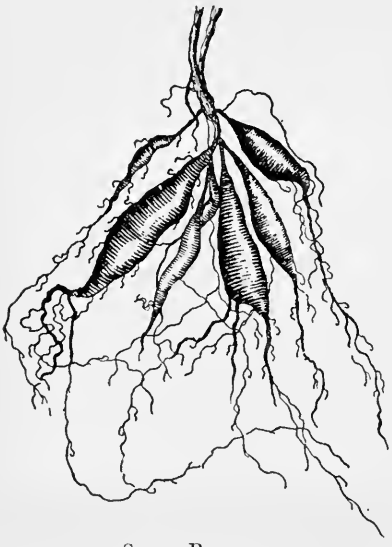


Gathering Potato Crop

unless given special attention. The parts of the sweet potato plant that are used for food are the fleshy roots which have large amounts of starch and sugar stored in them. Several roots branch from the crown of the plant, and these become thickened and fleshy for a length of a few inches or a foot or more. They contain enough sugar to give them a sweet taste.

Planting. — The sweet potato is the one root crop for which shallow plowing is practiced. On deeply

plowed lands, in which the soil is soft and loose, the fleshy roots are apt to grow too long, and not be large enough in diameter, so the land for sweet potatoes is usually plowed only five or six inches deep. Sweet potatoes do best on light, sandy soil that is warm and moist. About a month before the time to set out the plants, they are started by placing the roots in a hotbed and covering them with about two inches of soil. The young plants, which grow up from the roots, are pulled off when they are four to six inches high and transplanted to the field. The field is usually plowed into furrows, and the plants set out in the bottom of the furrow, either by hand or by a transplanting machine, setting them about twenty inches apart in rows, from two to three feet apart.



Sweet Potatoes

Cuttings. — Sometimes the crop is grown through the propagation of the new plants by cuttings or slips. Pieces of the vine, from one to two feet long, are cut off and planted in the soil, the same as the young plants

which are grown from the roots. Where the season is long enough, this method is preferred because the roots are many times affected with diseases, and these are avoided by using the slips.

Cultivation. — After the plants have started to grow, the ridges between the rows are cultivated down to level the field and cover the vines to a greater depth. The ground is tilled to keep the top loose, to kill weeds, and save moisture. Sweet potatoes are harvested by plowing or digging out the roots in the fall, before danger of frost. They are allowed to lie on the top of the ground in the sun for a few hours, until they are dry, when they are picked up into baskets and packed into barrels to send to market, or are stored in houses built to keep them through the winter.

Uses. — Sweet potatoes are used for human food, for stock food, for the manufacture of alcohol, and for other purposes. They make a delicious vegetable to serve with meats. They are more extensively grown in the United States than in other countries.

QUESTIONS

1. How are potatoes propagated?
2. What soil conditions are best for potatoes?
3. Under what climatic conditions do potatoes grow?
4. What are the five leading potato states? (See Yearbook of Agriculture.)
5. What methods are used in growing potatoes in the section in which you live? What are the varieties most generally raised?

6. What are the chief uses of potatoes?

7. What conditions of soil and climate do sweet potatoes require?

8. How are sweet potatoes grown?

PRACTICAL EXERCISES

1. Place a potato in a warm, moist place and watch the sprouting of the eyes or buds.

2. Cut a potato into several pieces, in such a way that each piece has one or two eyes. Plant these pieces in the ground or in a box of earth. From time to time pull up a plant to note the growth of roots and tubers. How long after planting do young tubers appear?

REFERENCES

Farmers' Bulletins: 35, Potato culture; 295, Potatoes and other root crops as food; 324, Sweet potatoes; 365, Farm management in northern potato-growing sections; 386, Potato culture on irrigated farms of the West; 407, Potato as truck crop; 410, Potato culls as source of industrial alcohol; 520, Storage and marketing sweet potatoes.

LESSON XXXII

MELONS, PUMPKINS, AND CUCUMBERS

Cultivation. — Watermelons, muskmelons, pumpkins, squashes, cucumbers, and gourds belong to the gourd family. All of them except gourds are cultivated as field or garden crops, and in the same general way. These vine crops are grown from seeds, planted in the spring, after the weather becomes warm. They are planted in hills from four to seven feet apart each way, and to a depth of one inch or less. They like rich loam soils, and long, hot seasons. The seeds of these vines retain vitality longer than most seeds, and they germinate better after two or three years than when fresh.

Watermelons have been prized as human food for more than four thousand years; and no doubt the ancient Egyptian farmer took pride in having large, ripe melons to share with his friends just as we do to-day. Watermelon seeds form quite an article of food in China; and in Africa there is a vine whose fruit has large, flat seeds that are eaten as we eat nuts. While watermelons grow in the northern part of the United States, yet they do best in the warm, sandy loams of the southern states.

Muskmelons are more easily grown than watermelons. The cantaloupes are furrowed, hard-rind melons, while the "nutmegs" are netted, soft-rind muskmelons.

MUSKMELONS

Pumpkins and squashes are raised for human food and also for stock food. As stock food they are often profitable crops, yielding as much as thirty tons per acre. The field pumpkin is often grown with corn; and when the corn is cut and shocked, the ground may be almost yellow with ripe pumpkins. They are used

for making pumpkin pies; and the canning of pumpkins for winter use is an important part of the work in canning factories.

Uses. — The squashes are cooked either green or ripe as a table vegetable, and the sweet varieties are used for pies. They are also fed to hogs and cattle. Squashes occasionally grow to enormous size, some weighing over 300 pounds.

Cucumbers are a standard garden vegetable, and are eaten fresh or pickled in salt or vinegar. **Gourds** are grown in this country mainly as curiosities.

QUESTIONS

1. What crop plants belong to the gourd family?
2. What conditions of soil and climate are required by watermelons?
3. How are pumpkins grown? What are the uses of this crop?
4. How does a cantaloupe differ from a nutmeg muskmelon?
5. What uses are made of squashes? Of cucumbers?

PRACTICAL EXERCISES

1. Place several seeds of each of this group of plants on a plate germinator and make a study of the seedlings of each kind.

REFERENCES

Farmers' Bulletins: 231, Spraying for cucumber and melon diseases; 254, Cucumbers.

LESSON XXXIII

TOBACCO

Planting. — Tobacco seed is planted in beds located in warm, well-drained spots with rich, loose soil. Brush or other wood is burned on the bed to make the soil loose and enrich it with ashes. In some localities, instead of using wood, the soil is heated by covering the bed with a large pan and applying steam. Whatever the process, the chief advantage of heating is that it kills weed seeds, bacteria, and fungi in the soil. After the seed is sown, boards are placed on edge around the beds and muslin is stretched over to keep in the heat.

Tobacco Plant

Cultivation. — The tobacco fields are plowed early in the spring and made loose and mellow by harrowing. When the plants in the beds are a few inches high they are taken up and set out in rows by hand or with a planter. After planting, the ground is cultivated until the plants are too large for the horses to pass between the rows.

Field of Tobacco

Suckers. — When the plants reach a height of about two feet, and have a dozen or more leaves, the tops are cut off to cause the leaves to grow larger. After the tops are removed, little suckers grow out from the stalks just above the bases of the leaves; and in order to secure large leaves of good quality, the farmer must remove these suckers, which would take up the food needed by the leaves. The farmer must also go over the tobacco field to remove the large green tobacco worms which feed upon the leaves.

Harvesting. — In the fall, when the leaves begin to turn brown, the farmer splits each tobacco stalk with a sharp blade down from the top to within three or four inches of the ground, and then cuts off the stalk at the top of the ground. Several of the cut plants

Curing House for Tobacco

are hung upside down upon a tobacco stick to cure. In a few hours, or a day or two, the tobacco is ready to be taken to well-ventilated barns, where the curing is completed.

Marketing. — When the farmer is ready to market his crop, he usually strips the leaves from the stalks, and stores them in barrels, being careful that the proper amount of moisture is present in the leaves.

In recent years the average acreage of tobacco is about one million acres, or one third the acreage of potatoes. The value of the tobacco crop is less than half that of potatoes. The leading tobacco states are Kentucky, North Carolina, Virginia, Ohio, Tennessee, Pennsylvania, and Wisconsin. The Connecticut valley is also an important tobacco region.

QUESTIONS

1. How is the seed bed prepared for tobacco seed?
2. When are the young plants transplanted?
3. What field work must be given to the growing crop of tobacco?
4. How is tobacco harvested?
5. What are the leading tobacco states?

REFERENCES

Farmers' Bulletins: 60, Methods of curing tobacco; 82, Culture of tobacco; 83, Tobacco soils; 120, Principal insects affecting tobacco plant; 343, Cultivation of tobacco in Kentucky and Tennessee; 416, Production of cigar-leaf tobacco in Pennsylvania.

LESSON XXXIV

VEGETABLE GARDENING

A garden is a small piece of land intensively cultivated. Here, better than in any other place, one may learn many lessons about crops and soils. In every

Vegetable Garden

newly settled country the gardens first show the possibilities of farming.

Uses. — The garden may be made the most interesting and instructive place on the farm. In the city, the garden on the city lot or the school garden affords

the children and the mothers and fathers interesting and enjoyable recreation. A little garden, perhaps not more than a rod square, may become a real playground on which one may rest the mind from business cares, keep himself in close touch with nature, and supply himself with good things to eat. Growing many different kinds of plants in the garden will increase our interest and pleasure in it. There is great enjoyment in growing some rare plant, or in growing all the varieties of some garden vegetable, or in producing the finest specimens.

Using the Wheel Hoe in an Onion Patch

Preparing the soil. — The first thing of importance is to make the soil of the garden as fertile as possible. This can be secured by careful tillage and the addition of fertilizers. If the soil is in good tilth and has an abundance of organic matter and mineral plant food, along with the proper conditions of moisture, success is almost certain with nearly all of the things we may plant. A vegetable garden is usually one of the most profitable things on a farm.

Long rows. — It is best to plant everything in long rows, so that the land may be cultivated with a horse cultivator or with a wheel hoe. Use level culture, except where ditches may be necessary to irrigate or drain the soil, or where trenches are needed for banking up celery or for throwing the soil toward peanuts or potatoes. Hilling up corn, tomatoes, and many other crops is of little or no value and makes unnecessary work. Keep out the weeds and never leave old plants or refuse, like cabbage stumps, in the garden through the winter. They may have insects or disease organisms on them that will injure the next crops.

QUESTIONS

1. What are some of the advantages that may be derived from gardens?
2. What are some of the most important rules to be observed in gardening?
3. What vegetables and flowers are suitable for garden planting?

REFERENCES

Farmers' Bulletins: 218, School garden; 220, Tomatoes; 255, Home vegetable garden; 282, Celery; 354, Onion culture; 359, Canning vegetables in the home; 433, Cabbage; 434, Home production of onion seed and sets; 460, Frames as a factor in truck growing; 488, Diseases of cabbage and related crops and their control.

LESSON XXXV

CROPS GROWN FOR BEVERAGES

Coffee, tea, and **cacao** are plants that are grown almost exclusively for beverages. While these three beverages are extensively used in the United States, yet with the exception of a small amount of tea grown in some of the southern states, the plants are not grown in this country.

Coffee is the seed of a tree that in cultivation is kept down to bush size. The coffee trees grow in moist, warm regions that are free from frost, and in a soil that contains a large amount of organic matter. The trees come into bearing when they are six years old, and continue to bear for thirty or forty years.

Coffee Beans and Blossoms

The coffee seeds or " berries " are inclosed in a pulpy fruit, and after they are picked, the first thing usually

done is to remove the pulp from the seeds. Then they are cured by leaving them in the sun for several days. When cured the two outer coverings are removed and the coffee is packed for shipment. Sometimes the coffee is dried before the pulp is removed and the pulp and coverings are removed afterwards.

About two thirds of the coffee crop is grown in Brazil. Large quantities are grown in Central America, the West Indies, and Java.

Picking Tea in Japan

Tea is the dried leaves of an evergreen shrub or small tree that grows mainly in China, Japan, India, and

Java. The plants require a warm, moist climate, and a soil with good drainage and a large amount of organic matter. The regular gathering of the leaves does not begin until the shrub is five years old, although a small amount of leaves may be taken in the third year. The leaves are picked several times a year. After picking, the leaves are dried and rolled, then dried again and packed for sale.

Cacao Beans

Cacao is the name of the tree whose seeds are used to make cocoa and chocolate. In the pods of this tree from thirty to fifty nuts or beans are inclosed in a pulpy mass. After the cacao beans are removed from the pods, they undergo a fermentation process and are then dried. Then the beans are shipped to factories in Europe and the United States, and used to make cocoa and chocolate.

Large quantities of cacao beans are raised in southern Mexico, Central America, and the tropical parts of South America.

QUESTIONS

1. What plants are grown primarily for beverages?
2. What is the greatest coffee-producing country in the world? What other countries produce coffee?
3. What is the general character of the coffee plant?
4. What are the leading tea-producing countries?
5. What is the general character of the tea plant?
6. Cocoa and chocolate are made from what part of the cacao tree?

REFERENCE

Farmers' Bulletins: 301, Home-grown tea.

LESSON XXXVI

LITTLE-KNOWN PLANTS

We use many well-known products that come from little-known crops in our own country, or from plants that grow only in foreign countries.

The Spices are a group of products from cultivated plants grown in foreign lands. Pepper, ginger, cloves, cinnamon, allspice, and nutmeg are well-known spices. Black pepper is the ground seed of a vine that grows in the East Indies. The principal red peppers are cayenne, chili, paprika, and sweet peppers. Cayenne or red pepper is the pulverized pods. The sweet peppers are pickled while green or dried after they are ripe. Ginger is made from the spicy roots of a plant that is raised in tropical countries. Cloves are the dried flower buds of an evergreen tree that grows mainly in the East Indies. Cinnamon is the inner bark of a tree that grows in many tropical countries. Allspice comes from the seeds of a tree grown almost exclusively in Jamaica. Nutmegs are the kernels from the seeds of a tree that grows in tropical regions.

Medicinal Plants. — Many medicines are produced from plants, and some of these are important farm crops. Ginseng, a plant native to America, is sold

TAPPING A RUBBER TREE

principally to the Chinese. Some plants are used for dyeing purposes. In early times, the indigo plant was an important crop in Virginia.

Sources of Tannin. — Many plants are raised for the tannin in them. Tannin is a material used for tanning skins. It is obtained from the bark of some trees, like the oak and hemlock. Canaigre is a plant belonging to the dock family, which is grown for the tannin contained in the thick roots.

Vanilla Bean

Rubber. — Most of our rubber comes from the rubber trees of Mexico, Central America, and South America. The milky sap of these trees is used to make rubber. The sap is obtained by making shallow cuts in the bark of the rubber trees and collecting the sticky liquid as it flows from the cuts. A shrub, called guayule, that grows in southwestern United States and northern Mexico, contains a sap from which rubber can be made. Many other plants have sap that may be successfully

converted into rubber. So much rubber is used for the tires of automobiles and other vehicles, that there is great interest in plants that yield rubber.

Chicle Gum. — Chewing gum is made from the sap of the chicle tree that grows in southern Mexico and Central America. The gummy sap is purified, and

Edible Mushrooms

boiled with sugar and flavors that make it taste good.

Flavors. — There are many plants raised for flavors. Lemon oil is extracted from lemons, and vanilla is made from the vanilla bean which is grown in Mexico and other tropical countries. Some years ago, it was found that peppermint will grow well in the black soils of Michigan, and some farmers became rich growing this plant for the peppermint oil it contains.

Mushrooms are an important crop raised by market gardeners. Since these plants grow in the dark, they are often raised in caves and cellars and under benches in greenhouses. These plants, having no green parts, must have ready-made food; and so the soil for mushrooms must contain a large amount of organic matter. While mushrooms are reproduced from spores, yet the usual method of propagation is to take small masses of the compost in which are the underground parts of the mushroom and plant these in the new mushroom beds. Each little cube of dried compost containing the white threads is called mushroom spawn.

Hops. — In parts of the United States, hops are an important crop. Hop plants are vines that are grown on poles. The hops are picked and pressed into bales for market. These pods, called hops, are used in brewing to flavor beer.

QUESTIONS

1. What plants yield spices?
2. What is rubber? How is it obtained?
3. What plants are valuable because of their medicinal properties?
4. What plants yield tannin? What use is made of this product?
5. What plants are grown for the flavoring extracts that are made from them?
6. How are mushrooms raised?
7. What use is made of hops?

PRACTICAL EXERCISES

1. For study obtain samples of the plants mentioned in the lesson. Procure samples of crude rubber.

2. Make a cut in the bark, leaf, or fruit of the Osage orange tree. The milky sap that flows from the wound closely resembles the sap of rubber trees. The rubber trees and the Osage orange tree belong to the same family.

LESSON XXXVII

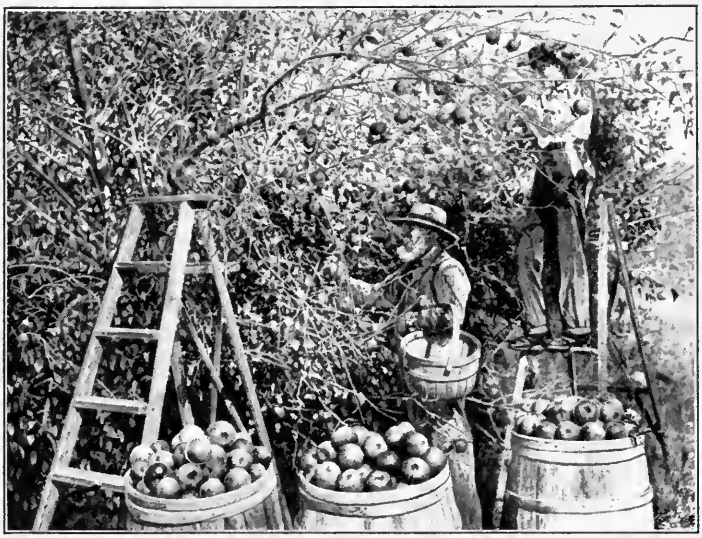
POME FRUITS

Apples. — The apple-like fruits are called pomes. A pome is a fruit having a core which contains the seeds and is surrounded by the fleshy part. The principal pome fruits are apples, pears, and quinces. The apple is the most common and the most highly prized of all fruits.

Apple trees will live and bear fruit in almost every part of this country. No other fruit, unless it is the strawberry, will grow in so many different kinds of climate and soil; and there are comparatively few farmers who do not plant apple trees. Apples will grow best on a rich, sandy loam with good drainage; but almost any soil will do if it has good drainage, so that the roots do not stand in water.

Propagation. — Apple trees are propagated by taking buds or scions from trees of the variety we wish to grow, and grafting them on the seedling trees which have been grown from apple seeds. When the grafted trees are one or two years old, they are set out in orchards. They are planted from twenty to forty feet apart, each way. Growing clover or alfalfa on the land is good preparation for apple trees. The ground of the

orchards should be tilled in order to kill weeds and reduce the loss of moisture. Usually trees begin to bear five years after setting out; and with proper care they will continue to live and bear fruit during the farmer's lifetime.



Apples should be handled with Care

Uses. — Apples are eaten raw and are cooked in many ways. They are boiled for sauce, baked, roasted; and made into pies, butter, jelly, preserves, and pickles. They are ground up and the juice pressed out for cider, and the cider is allowed to ferment into vinegar. Many apples are dried for winter use. Apples and the pulp from cider mills may be used for feeding stock.

Pears are not quite so hardy as apples, but they are grown almost everywhere. They are picked before they are fully ripe and are allowed to ripen after they are placed in storage. This is done because if they are allowed to ripen on the tree, they store up in the flesh, especially around the core, hard particles like sand which are called pear grit. They do not contain so much grit if they are picked green and placed in storage to ripen.

Quinces are not an important fruit. They are used for jelly and preserves. Loquats are grown in the South and in California. They are used mainly as fresh fruit.

Dwarfing. — Pear trees may be dwarfed by grafting them on quince seedlings. Apple trees may be dwarfed by grafting them on dwarf kinds of seedlings. The dwarfed trees may be planted closer together than the ordinary trees. They are easier to spray and the fruit can be gathered without ladders.

QUESTIONS

1. What is the most important fruit grown in this country?
2. What is a pome? What are the principal pome fruits?
3. What kind of soil is best for apple trees?
4. How are apple trees propagated?
5. Why should pears be picked before they are ripe?

PRACTICAL EXERCISES

1. On a certain day, each pupil should bring, if possible, good specimens of the apples grown in the home orchard.

The pupil should know the names of the apples he brings. Then the whole collection should be studied until each pupil is able to recognize the apples of many varieties. The general appearance, keeping qualities, and flavor of each should be studied. In a town or city a single apple of each of several varieties on sale in fruit stores may be studied.

2. To illustrate the general plan of propagating apple trees the following exercise should be performed. Plant a number of apple seeds in the ground; and when the seedlings come up in the spring, carefully cultivate them in order to get rapid growth. In the fall remove the young trees with their roots from the ground, tie them in a bundle, and keep in moist sand in a cool cellar through the winter. Store in the same way the scions cut from a vigorous apple tree of the variety that you wish to propagate. Sometime during the winter the scions should be grafted to the seedlings at the point where the stem of each joins the root system. Place the grafted trees in the sand and in the spring set them out in the nursery bed. After two more years of growth, the trees may be transplanted to the ground where they are to remain permanently. Consult your teacher about the details of grafting.

REFERENCES

Farmers' Bulletins: 113, The apple and how to grow it; 153, Orchard enemies in the Pacific Northwest; 171, Control of codling moth; 283, Spraying for apple diseases and codling moth in the Ozarks; 291, Evaporation of apples; 482, The pear and how to grow it; 492, The more important insect and fungous enemies of the fruit and foliage of the apple.

Selected Readings: An Apple Orchard in the Spring, — William Martin; The Planting of the Apple Tree, — W. C. Bryant; The Little Red Apple Tree, — James Whitcomb Riley; The Apple, — John Burroughs.

LESSON XXXVIII

STONE FRUITS

THE *peach*, *cherry*, *plum*, and *apricot* are called stone fruits because the seeds are inclosed in stonelike hulls.

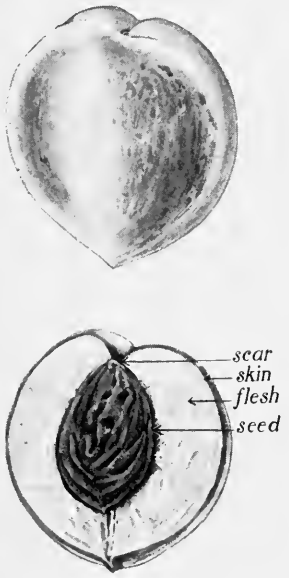
Peaches are grown in all parts of the United States, but the commercial growing of peaches is mainly confined to the regions which are comparatively free from late spring frosts. Large quantities are grown in the Southern and Pacific states. On the east and south shores of the Great Lakes, where the presence of water prevents extreme changes of temperature, great crops of peaches are produced.

Location of orchards. — Peaches do best in well-drained sandy loams. The orchards should be placed on high ground from which cold air will drain off to lower ground. Killing frosts are more likely to occur on low ground than on neighboring hills and slopes, for the cold air, like water, will flow down the slopes and settle in low places.

A northern slope is considered better than a southern slope, for on the northern slope, which is turned away from the sun, the opening of the buds is delayed until the danger of frost is past.

Propagation. — Peaches, as well as the other stone fruits, are propagated by growing seedling trees from seeds and then grafting the seedlings with buds from the variety to be grown.

The trees do not live so long as apple trees; nor do they grow so large and therefore they may be planted more closely together. A good distance is fifteen or twenty feet apart each way.



PEACH

The fruit. — The common peaches are covered with fine hair or fuzz. The nectarine is a variety with a smooth surface. Peaches whose flesh is free from the stones are called freestones, and those whose flesh is firmly held to the stones are called clingstones.

Peaches are extremely perishable, and must be used within a few days after they are ripe. They are eaten raw, and may be canned, dried, or preserved.

Plums are grown in all sections of the United States, but the states of California, Oregon, and Washington produce nearly four fifths of the entire yield. Outside of the Pacific states they are grown only for local use.

Kinds of plums. — In this country three general kinds of plums are grown. The Japanese plums are

grown in the warmer sections. The European plums are generally grown in the northern states. In climates too severe for the Japanese and European varieties, the American plums, which have been developed from native wild forms, are cultivated.

Prunes. — The sweet plums are called prunes. They have so much sugar in them that they will preserve themselves, like raisins, when they dry. Dried prunes are an important article of food.

Plum Orchard in Bloom

Cherries are grown on nearly every farm for domestic use, but their production on a large scale for commercial purposes is confined mainly to California. The states leading in the production of cherries are California, Pennsylvania, Indiana, Michigan, Ohio, and New York.

Cherry trees come into bearing in three or four years after being planted. They are set out from ten to

fifteen feet apart each way. They do well in any well-drained, rich soil and will grow with less moisture than most fruits.

Apricots are largely raised in the South; and in California there are apricot orchards many acres in extent. The fruit is eaten fresh, and it may be dried or canned for winter use.

QUESTIONS

1. What are the most important kinds of stone fruits?
2. Where are the great peach-growing sections of the United States?
3. What situations are best for peach trees?
4. How are peach trees propagated?
5. What are nectarines?
6. Where is the great plum-growing section of the United States?
7. What are prunes?
8. What states lead in the production of cherries?

PRACTICAL EXERCISES

1. In the fall select good peach stones from healthy trees, and keep them through the winter out-of-doors in a box of sand so that the shells may be softened by freezing and thawing. In the spring plant the seeds in a bed in the garden. The young seedling trees will grow three or four feet high during the first season.

In August or September each seedling should be budded with a bud taken from a tree of the variety you wish to propagate. In the South, budding should be done a few weeks earlier. Make a T-shaped cut in the bark of a seedling, and in the cut insert a bud with a little shield of its own bark. Close the

edges of the bark together and tie with a strip of cloth. As soon as the bud begins to grow, cut off the young tree a few inches above the bud, and remove all other buds that may grow on the tree. From this transplanted bud will develop the trunk and branches of a tree that will bear fruit of the same kind as that of the tree from which the bud was taken.

REFERENCES

Farmers' Bulletins: 80, Peach twig-borer, an important enemy of stone fruits; 440, Spraying peaches for the control of brown-rot, scab, and curculio.

LESSON XXXIX

CITRUS FRUITS

Where grown. — The orange, pomelo, or grapefruit, lemon, lime, and citron are citrus fruits, which grow in tropical and semitropical regions. They are grown in California, Arizona, Florida, and the coastal belt in Texas, Louisiana, and Mississippi. Southern California is by far the greatest citrus region of our country. This region extends into northern California in the Sacramento valley.

Orange and lemon groves present a beautiful sight. The trees have glossy, evergreen leaves and they blossom and bear fruit all the time. On a single tree there may be fragrant white blossoms and ripe fruit at the same time. The trees will adapt themselves to a great variety of soils. Large citrus crops can be grown from soils which are regarded as worthless for ordinary agriculture. But a rich loam that permits free drainage is best for these trees.

Propagation. — In California the citrus trees are grown in regions that were formerly deserts. The trees are planted from twenty to twenty-five feet apart each way. Formerly the orange and lemon trees were

grown from seeds, but now they are propagated by budding the desired varieties to seedlings. It is evident that seedless oranges cannot be grown from seeds. When the orange trees are set out, they are trimmed back, so that the branches start out from the trunk at a distance of two or three feet above the ground.

Orange Tree

Cultivation.—The orange and lemon orchards are cultivated in the same way. The ground is kept covered with a loose soil mulch by frequent cultivation, so that there will be only a slight loss of soil moisture. In the western citrus section the orchards must be irrigated. In the southern belt the orchards are not irrigated, for the rainfall is sufficient.

Uses. — Oranges are generally eaten in their natural state, although they are sometimes preserved. A drink called orangeade is made from the juice of the orange. The juice of the lemon is used for flavoring foods and also for making lemonade.

An important industry. — In California the orange and lemon industry has reached such proportions that thousands of carloads are shipped each year to eastern markets. The citrus industry in Florida is not nearly so extensive as in California. But the Florida citrus crops reach the eastern market centers with less cost of transportation than the western crops.

Orange Grove of California in Surface Irrigation

Both seedless oranges and those with seeds are grown, but the growing of seedless oranges is increasing. The most important variety is the Washington Navel, a seedless orange which is extensively raised in California.

The kumquat is a dwarf orange grown in the southern citrus belt. It is used to make preserves or to eat in the natural state.

Grapefruits are grown in California and Florida. The trees require about the same treatment as orange trees. The fruit is served as a first course, usually at breakfast. The **citron** is a large citrus fruit. The dried citron which we buy is the candied rind of this fruit.

QUESTIONS

1. What citrus fruits are raised in the United States?
2. Where are the citrus regions of this country?
3. What climatic conditions are necessary for the growing of citrus fruits?
4. How are orange and lemon trees propagated?

PRACTICAL EXERCISES

1. On boxes of citrus fruits in stores, look for the name of the place where the fruit is grown.
2. Obtain samples of oranges, lemons, limes, grapefruits, and citrons; and manufactured products of these fruits.
3. Plant seeds of oranges, lemons, and grapefruits, and study the young plants of each.

REFERENCES

If you live in a citrus-growing state, write to the Agricultural College for bulletins on the growing of citrus fruits.

Farmers' Bulletins: 171, Scale insects and mites on citrus trees; 238, Citrus fruit growing in Gulf States.

LESSON XL

GRAPES

The grapevine has been cultivated since early times for the wine which is made from the juice of the grape. In modern times we are using more and more of the grapes as raisins and fresh fruit. On nearly every farm in the United States, the grapevine is grown to supply the family with grapes for table use and for canning and making jelly. In the greater part of the country grapes are grown only to supply the local demand. The Pacific states, the eastern and southern shores of the Great Lakes, and the South Atlantic and Gulf region are the three principal sections that raise grapes on a commercial scale. California is far ahead of any other state in the production of grapes.

Varieties. — In the Pacific states the European varieties are almost exclusively grown. Varieties developed from native American species and hybrids of European and American vines are grown in the Great Lakes region. In the southern section both the European and American varieties are grown, but the American vines are raised in greater number. The western vineyards produce grapes for table use, for raisins, and for wine. In the eastern part of the country the grapes are grown mainly for table use. The Chautauqua

district of western New York is an important center of grape juice manufacture.

Propagation. — Grapevines are propagated from cuttings, and by layering, budding, and grafting. In starting new varieties the seeds are planted.

Bunch of American Grapes

Soils.—The grape will thrive in a variety of soils. In northern United States the most important thing to consider in the location of vineyards is frost prevention. The vineyards are located near rivers or lakes and on slopes from which frosty air will flow down to lower levels.

In California the grapes are grown in irrigation districts and the vineyards are cultivated to secure the loose soil mulch which saves soil moisture. Some of the vineyards are thousands of acres in extent.

Raisins are produced only in the hottest part of the dry region. The raisin grapes have so much sugar in them that they are preserved by drying in the open air.

The grapes are spread on large flat trays placed on the ground between the rows, and allowed to dry in the sun. Some of the raisins are packed with the seeds in them, while others are taken to a seeding mill where the seeds are taken out by machinery and the seeded raisins are then put in packages to be sold.

Grape Culture

A large amount of grape juice is now put up in bottles, so it will keep in the unfermented state. It is a refreshing drink.

Training the vines. — In the eastern part of the United States the vines are supported by stakes or by trellises of boards or wire. In the West in most of the vineyards a strong stumpy trunk of the vine is obtained by pruning, and the fruiting branches are supported by this trunk.

Pruning. — An important part of the work in raising grapes is the pruning of the vines. The old branches of the vine that have borne fruit are cut back, leaving only a short length with one or two buds which develop the fruiting branches or canes which bear fruit the following season. By pruning, the proper shape of the vine is secured and the quality of the grapes is improved.

QUESTIONS

1. Where are the important grape-growing sections of the United States?
2. What products are made from grapes?
3. What is the most important element of climate to be considered in determining the proper site for a vineyard?
4. By what means are grapevines supported?
5. How are raisins manufactured?
6. What varieties of grapes are grown in the locality in which you live?

PRACTICAL EXERCISES

1. In the fall after the leaves have fallen, cut off several twigs, six to twelve inches long, from a vigorous grapevine. Tie the twigs in a bundle and place them in a box of moist sand in a cool cellar and keep them through the winter. In the spring place the cuttings in mellow soil. Plant them a few inches apart and at such a depth that only the buds at the upper end are above ground.

2. In the spring bend down a cane of a grapevine and fasten in a shallow trench of mellow soil. A cane near the ground and of the last season's growth should be selected. When shoots from the buds are well started fill the trench with soil. Roots will then form at the base of each shoot. In the following fall

take up the cane and cut it into parts so that each shoot and root system becomes a new plant.

REFERENCES

Farmers' Bulletins: 118, Grape growing in the South; 156, Home vineyard with special reference to northern conditions; 175, Home manufacture and use of unfermented grape juice; 284, Insect and fungous enemies of grape east of the Rocky Mountains; 471, Grape propagation, pruning, and trimming.

LESSON XLI

SMALL FRUITS

Picking Strawberries

Berries and other small fruits are among the best things grown by the farmer and gardener. The most common small fruits are the strawberry, raspberry, blackberry, gooseberry, and currant. Nearly every farmer grows at least two or three of these fruits. The cranberry is grown in bogs or swamps where the

plants are flooded with water during part of the time; and the raising of cranberries is a special business. Huckleberries, blueberries, and June berries are gath-

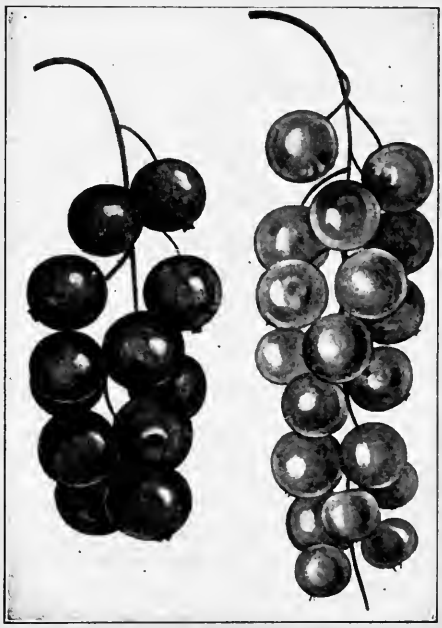
Strawberry Runner

ered from wild bushes or trees, and as yet are little cultivated.

Blackberries

The strawberry is grown in more parts of the world than any other fruit. It will grow in hot and cold climates, and on a variety of soils. It does best on rich, moist soil. Strawberries are propagated by transplanting the young plants which are formed on the runners of old

plants. They are planted in hills or in rows. The rows are about three feet apart, and the plants in the rows from twelve to eighteen inches apart. They will yield a full crop of fruit the second season after they are planted. The strawberry bed should be replaced every three or four years, as the young plants produce the most and best berries. Straw is used to mulch the plants in order to save moisture, prevent the growth of weeds, and keep the berries off the soil, so that they will be clean when picked.



Red and White Currants

Raspberries, blackberries, and dewberries are propagated from root sprouts or by layers. The red raspberry and the blackberry are started from the root sprouts, while the blackcap raspberry is started from layers. Layers are the tops of the branches or canes laid down and covered with soil until they take root, when they are cut off and set out

as new plants. Raspberries and blackberries bear their fruit on second-year canes. The new canes which come up during any summer bear fruit the following summer. After fruiting, the old canes die and should be cut out as soon as the berry crop is harvested. There are many varieties of raspberries and blackberries and also hybrids of these two plants. The loganberry is the most common hybrid of the raspberry and blackberry.

Currants and gooseberries are among the easiest fruits to grow. They are very hardy and may be grown in any garden. They are propagated by cuttings of the two-year-old stems. They are set out about four feet apart each way; and if properly cultivated and pruned, they will bear fruit for many years.

QUESTIONS

1. What are the most common small fruits grown in the United States?
2. What methods are used in growing strawberries?
3. How are the red raspberry and the blackberry propagated?
4. What is the loganberry?
5. What soil and moisture conditions are required by cranberries?
6. How are new plants of currants and of gooseberries produced?

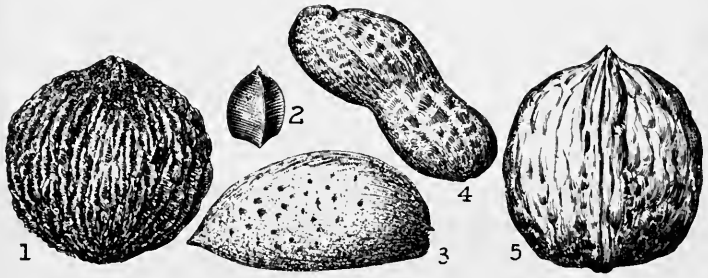
REFERENCES

Farmers' Bulletins: 154, Home fruit garden, preparation and care; 176, Cranberry culture; 178, Insects injurious in cranberry culture; 198, Strawberries; 203, Canned fruit, preserves, and jellies, household methods of preparation.

LESSON XLII

NUTS

Kind of nuts. — Nearly all persons eat nuts as luxuries, either in the natural state, or roasted, or in candies; and many people use them as regular articles of food. Hickory nuts, walnuts, butternuts, chestnuts, hazelnuts, beechnuts, and piñon nuts are common examples

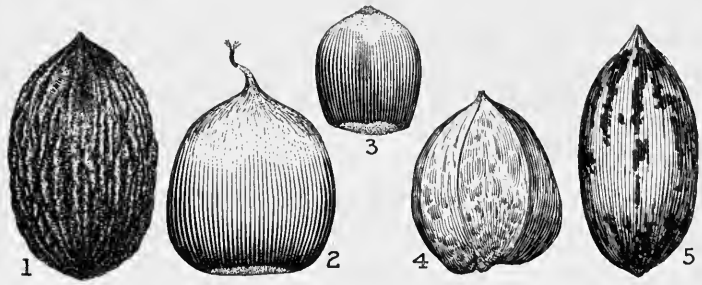


1. Black Walnut. 2. Beechnut. 3. Almond. 4. Peanut. 5. English Walnut

of American wild nuts. The piñon nuts are the large seeds in the cones of the piñon pines of southwestern United States. Chestnut trees are cultivated on some farms, but in Italy and other countries of southern Europe chestnuts are an important crop. In these countries they are roasted, or ground into flour and used to make bread. Chestnuts from these countries are shipped to the United States. There are three

kinds of walnuts: the black walnut, white walnut, or butternut, and the Persian or English walnuts.

Nut trees that are grown on a large scale are the English walnut, almond, and pecan. English walnuts and almonds are raised extensively in California. There are two kinds of almonds; bitter almonds, used for bitter almond oil, and the sweet almond, used as an edible nut. The pecan is a kind of hickory nut that is grown on a commercial scale in the South.



1, Butternut. 2, Chestnut. 3, Hazelnut. 4, Hickory Nut. 5, Pecan

Large pecan orchards are planted in Texas, Mississippi, Louisiana, and the South Atlantic states. The nuts are large and have thin shells called paper shells.

Peanuts are the most common and cheapest nuts found in the market. They are grown principally in the South, but the Spanish peanut may be ripened in the northern states if given proper care. The small, Spanish peanut gives the largest yields, and it grows in the form of a bush pea, instead of having trailing vines. They are usually shelled and sold as salted

peanuts. They yield from forty to more than one hundred bushels per acre.

Stacking Peanuts

Peanut Plant

Planting.— The shelled nuts or the seeds left in the shell are planted in the spring. The soil is plowed and harrowed to make a loose seed bed, and the seeds are planted about two inches deep and ten or twelve inches apart in the rows. They are cultivated to keep the ground loose and to kill weeds.

Harvesting. — In the fall they are harvested by plowing up the nuts and then throwing the vines and nuts in piles. These piles are made by stacking the plants around stakes driven into the ground. In these stacks, which are about two feet across and five feet high, the nuts and vines are dried and cured. They are then hauled to some spot in the field or to a shed where the nuts are picked off the vines by hand or machine.

As they may have particles of soil sticking to them, the nuts are run through polishing machines that clean and brighten them before they are placed in sacks for market.

Uses. — The peanut crop has many uses. The plants are used for hay, which is about equal to clover hay in food value. The whole plants or the vines after the nuts are picked are fed to stock. They are sometimes used to feed hogs by letting the animals root the nuts out of the ground.

Roasting. — In this country the peanuts are roasted before they are eaten, though some people like them raw. Many peanuts are shelled by machinery and are used for making salted peanuts. Peanut oil is used like olive oil, and after the oil has been pressed from the nuts, the peanut cake is used to feed stock. Peanuts are also used to make peanut butter.

Rotation. — Peanuts are leguminous plants, closely related to the peas and beans. Like other legumes, this crop gathers nitrogen in the roots, and is becoming an important rotation crop for nuts, forage, and soil improvement. Peanuts will grow in almost any soil, but light-colored soils are preferred, as dark soils are apt to stain the hulls.

QUESTIONS

1. What kinds of trees yield nuts that are used as food?
2. What nut trees are grown on a commercial scale?
3. What are pecans?

4. What methods are used in raising peanuts?
5. What uses are made of a peanut crop?

PRACTICAL EXERCISES

1. Make a collection of all the edible nuts growing on trees in your locality. Make also a collection of other nuts that may be found in the markets.

2. Plant several unroasted peanuts and study the growth of the young plants.

REFERENCES

Farmers' Bulletins: 332, Nuts and their uses as food; 431, The peanut.

LESSON XLIII

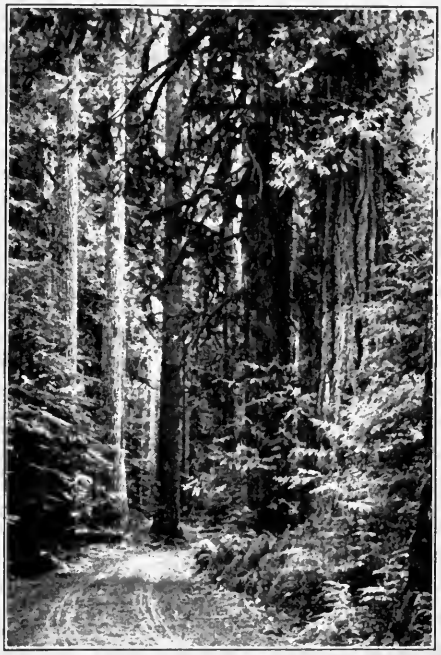
FORESTRY

Forests. — The forest lands of the United States consist of many small woodlots on farms, and extensive forests owned by lumber companies or by the states or the national government. Most of the large forest areas to-day are located in the Appalachian, Rocky, Cascade, and Sierra Nevada mountains, and in the Great Lakes region and the coastal plain of the southern states. The farm woodlots are remnants of the former forest or are new forests set out by the farmers.

Windbreaks. — On the prairies small groves are planted on the windward side of farm buildings for protection against the cold winds of winter and the destructive winds of summer. These groves also give shade and beauty to the homesteads. Narrow belts of trees are planted also along the windward side of farms to protect the crops against wind. Sometimes groves are planted on the prairies with rapid-growing trees to furnish a supply of fuel, poles, and posts. The hardy catalpa has been most extensively planted for this purpose.

Effect on water supply. — Forests on mountain slopes prevent the rapid flow of surface water in times of heavy rainfall, by holding much of the rain in the spongy

mass of leaves and humus on the forest floor. This water gradually sinks into the ground, and weeks and months later it appears in springs that flow into the streams. In this way floods are reduced and a greater flow of water obtained in the dry months of the year. These forests also protect winter snows from melting rapidly in the spring, and thus the flow of streams is made more regular.



FORESTS PREVENT THE RAPID FLOW OF WATER DURING HEAVY RAINFALL

National forests. — In order to conserve the water for power and irrigation the national government has formed large National Forests in the western states. These forests occupy public lands, and thus are the property of all the people of the United States. Not only will these forests regulate the flow of water for power and irrigation, but they will be important sources of lumber and other forest products.

Improving the stand. — In the millions of farm wood lots the farmers can do very important work in forestry by improving the stand of trees. Diseased trees and species of little value should be cut down and replaced by trees of high value. Each wood lot should also carry a full stand of trees. In order to improve the wood lots the farmers should know the leading species of timber trees, the uses of each species, the market demands, the best methods of dealing with diseases and insects that attack forest trees, the effect of grazing upon the wood lot, and the best methods of growing and transplanting young trees.

Arbor Day. — In order to encourage tree planting and arouse an interest in the general problems of forestry, many states have selected one day in the fall or spring as Arbor Day and made it either a legal holiday or a school holiday. While much good work has been done on Arbor Day, yet in the whole country millions of young trees set out on this day have died because the work was done so poorly. Since the planting of young trees is practical work in forestry, the pupils should do it so well that the trees will continue to grow after planting.

QUESTIONS

1. Where are the great forest areas of the United States?
2. For what purposes are trees planted in the prairie region of the United States?
3. How do forests lessen floods?
4. Of what service are forests to irrigation?

5. What are the uses of the National Forests?
6. What can be done to improve the farm wood lot?
7. What are some of the most common shade trees?
8. What trees make good fence posts?
9. What trees may be propagated by planting cuttings?
10. What places in your locality should be devoted to the growing of trees? Why?

PRACTICAL EXERCISES

1. Make a list of all the trees that grow in your locality.
2. Collect specimens of sawed pieces of wood.
3. Collect twigs of the various species of trees. Fasten the twigs to sheets of cardboard and label properly.
4. Collect seeds of many trees. Keep them in bottles or small glass jars. What trees have winged seeds? What trees have seeds inclosed in cones?
5. In the early fall collect leaves of forest trees. Place the leaves between sheets of blotting paper or carpet paper, and keep under several pounds pressure until they are dry. Then mount them on sheets of stiff paper. On each sheet give the name of the tree to which the leaves belong, and the place and kind of ground in which the tree grew. Ask your teacher for full directions for collecting, drying, and mounting leaves.

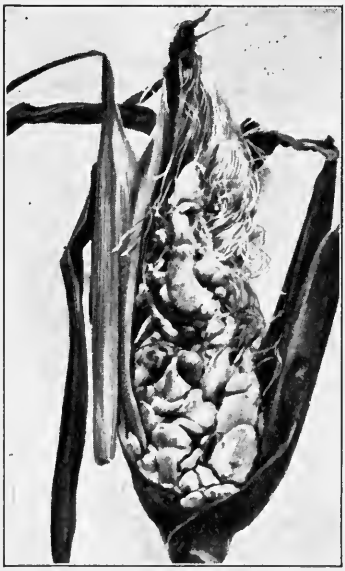
REFERENCES

Farmers' Bulletins: 67, Forestry for farmers; 99, Three insect enemies of shade trees; 134, Tree planting on rural school grounds; 173, Primer of forestry, pt. 1; 358, Primer of forestry, pt. 2; 228, Forest planting and farm management; 387, Preservative treatment of farm timbers; 421, Control of blowing soils; 423, Forest nurseries for schools; 468, Forestry in nature study; 476, The dying of pine in the Southern States: cause, extent, and remedy.

LESSON XLIV

WEEDS AND PLANT DISEASES

Weeds are plants that grow where they are not wanted. The farmer tills the soil, plants the seed, and adds fertilizers for the useful crop he expects to grow. Then the unwelcome weeds come to rob the soil of the needed moisture and fertility. The farmer tries to destroy them by soil tillage, but year after year weeds still infest the fields.



Smut on Corn

Value of weeds.—Some people consider weeds useful because they make it necessary for the farmer to cultivate his crops in order to kill the weeds. Sometimes, however, the stirring of the soil for the necessary destruction of weeds has to be done at a time when it is not best for

the crop. Hence, the wisest plan is not to have the weeds. Those that do grow should not be allowed to go to seed; and great care should be taken not to plant weeds with the seeds of the crop.

Weeds and rotation. — The system of cultivation and rotation, the kinds of crops raised, and the time of planting and harvesting may be partly determined by the presence of weeds. The farmer who practices the right system never worries about weeds, for he can usually control them without much difficulty. Some crops, as millet, for example, may be planted so early and may grow so quickly that the weeds do not get a chance. Alfalfa, which grows rapidly and is cut several times a year, will keep the land free from almost all kinds of weeds. This is especially true after the first year.

Smut on Wheat

Kinds of weeds. — There are many kinds of weeds. Ragweeds, cockleburs, purslane, Canada thistles, dandelions, wild mustard, sorrel, dodder, and jimson weeds are a few of the most common species. What other

kinds can you name? What is the most troublesome weed in the vicinity in which you live?

Plant diseases. — Cultivated plants are subject to many diseases, nearly all of which are due to bacteria or fungi. Wheat rust is a disease caused by fungi that live on the wheat and penetrate into the living tissues of the plant. The rust particles are the spores of the fungi. Pear blight is due to bacteria in the sap of the tree. The farmer must do many things to keep his plants healthy. Some of the smuts on grain may be prevented by treating the seeds with chemicals that destroy the spores of the fungi that cause the smuts. When fungi grow on leaves or fruit, as in the case of leaf blights and the apple scab, spraying with chemicals will kill the fungous growth. When the disease is due to bacteria in the sap, like pear or apple blight or the bacterial disease of squash vines, the only thing that can be done is to destroy the diseased plants, in order to prevent the spread of the disease.

Smut on Oats

One of the best ways of controlling plant diseases is breeding for the production of disease resistance.

In this way plants may be obtained that are immune from certain diseases.

QUESTIONS

1. What is a weed?
2. What are the most common weeds in your locality? Which of these are regarded as the worst pests?
3. In what ways are weed seeds carried from place to place?
4. What are some of the most common plant diseases?
5. What methods are used to destroy or prevent plant diseases?

PRACTICAL EXERCISES

1. Dig up a burdock in order to study the whole plant. Examine the leaves and the roots. Do grazing animals eat the leaves? Does cutting off the stem at the top of the ground kill the plant? How are the seeds distributed?
2. Make a study of the dandelion. Count the number of seeds in a ripe dandelion head. Through how many months of a year do dandelions bloom? How are the seeds distributed? Where are the leaves placed? Dig up several plants and examine the roots. What advantages have dandelions that make them persistent weeds?
3. Collect the seeds of a large number of weeds and keep them in small bottles.
4. Bring to school specimens of plants with such diseases as potato scab, smuts of grain crops, pear blight, downy mildew of the grape, peach leaf curl, apple scab, apple rust, brown rot of the peach, black knot of the cherry and plum, " pod spots " of beans, etc.
5. Kill the smut spores that may be present in seed oats by the use of formaldehyde. In a barrel place 40 gallons of water and add one pint of formaldehyde of standard strength

(40 per cent). This will be enough to treat 40 bushels of oats. On a clean floor spread the grain to a depth of about six inches. Sprinkle the formaldehyde solution over the grain and mix thoroughly with a scoop shovel until all the grain is moistened. Then shovel the grain into a pile and cover it with sacks, blankets, or canvas, and leave for eight or ten hours. If this work is done in the evening, the grain can be left in the pile over night and sown the next day. If a drill is used, the grain should be spread out and dried before sowing. If sacks are used to hold the grain, they should be well moistened with the solution.

For experimental purposes a small amount of oats can be treated with a proportionately small quantity of the formaldehyde solution. Sow the treated grain in a small plot of ground, and in another plot a considerable distance away sow untreated grain. When the oats are nearly ripe, look for smut in the plots.

REFERENCES

Farmers' Bulletins: 28, Weeds, and how to kill them; 86, Thirty poisonous plants of United States; 219, Lessons from the grain-rust epidemic of 1904; 221, Fungous diseases of the cranberry; 243, Fungicides and their use in preventing diseases of fruits; 250, Prevention of stinking smut of wheat and loose smut of oats; 368, Eradication of bindweed, or wild morning-glory; 489, Two dangerous imported plant diseases.

LESSON XLV

MIXED FARMING

Mixed farming is the raising of crops and live stock on the same farm. Some kinds of animals are kept on nearly all farms. Horses and mules are used for work, cattle for beef and milk, hogs for pork, sheep for mutton and wool, and poultry for eggs and meat.

Advantages. — There are many advantages in raising live stock on the farm in connection with growing crops. Plants require organic matter in the soil as well as mineral matter, and if crops alone are raised and sold off the farm, there can be very little return of organic matter to the soil. If the plants that are raised on the farm are fed to stock, a large amount of organic matter in the form of manure is returned to the soil and thus the farm keeps up in fertility. It has been observed that live-stock farmers are nearly always prosperous.

There is another advantage in raising animals and crops on the farm. Animals must be cared for every day, but they require more attention in the winter than in the summer. During the summer season the labor is put on the fields to produce the crops; and in

the winter season the labor is used to feed the animals, milk the cows, and give other needed attention. If crops alone are raised, there is an excess of work during the summer and too little labor during the winter. In order to support the animals a considerable acreage must be put in grass, hay, or other forage crops; and so there will be a rotation of crops that will help to keep the soil fertile.

Feeders. — Many farmers use all their land for the production of crops in the summer, and then buy "feeders" for winter feeding. The name "feeders" is given to animals that are sold to the farmers to be fattened for the market. In some parts of the country the feeding of cattle and sheep has become an important industry. Many of these animals are bought from the grazing sections of the country and then well fed with grain and hay until they are ready for the market. A farmer with 80 or 160 acres of land with a good part of it in clover or alfalfa will buy a large number of lambs, older sheep, or cattle; and if he does not have enough grain to feed with the hay, he buys corn, or other grain or mill stuffs. Sheep will usually get fat enough for market in three or four months' time. Beef cattle are usually fed five or six months before marketing. This kind of farming enables the farmer to dispose of his hay and grain by feeding it on his own farm, supplies a large amount of manure for his fields, and furnishes a pleasant and profitable work through the winter months, when, otherwise, he would be idle.

QUESTIONS

1. What is meant by the term "mixed farming"?
2. What are some of the disadvantages of raising only crops on a farm?
3. How does the raising of farm animals help to maintain soil fertility?
4. How does the raising of crops and animals affect the distribution of farm labor through the year?
5. In your locality what crops are mainly disposed of by feeding to animals on the farm where the crops are grown?

REFERENCES

Farmers' Bulletins: 192, Barnyard manure; 242, Example of model farming; 272, Successful hog and seed-corn farm; 299, Diversified farming under plantation system; 310, Successful Alabama diversification farm.

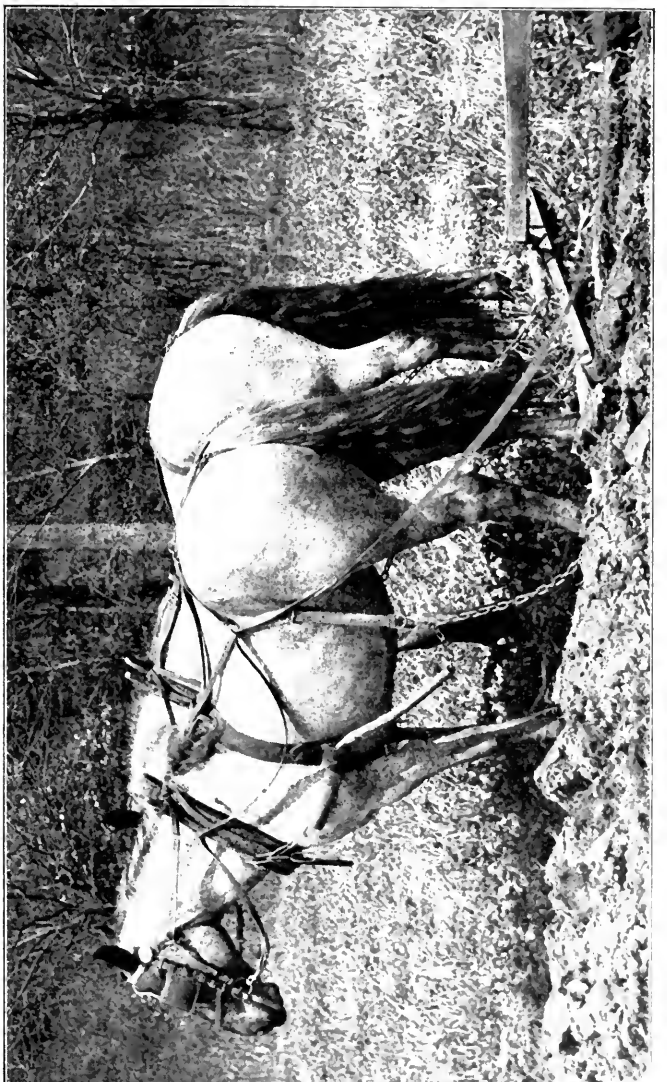
LESSON XLVI

HORSES

A faithful friend. — The horse is man's noblest friend among the farm animals. He is the main source of power for the pulling of farm machinery, the hauling of loads, and the transportation of people, and is almost indispensable on any farm. The horse has such power and endurance, is so easily trained and controlled, and possesses such useful traits that no other animal or power can take his place. If one becomes lost in a wilderness or in the darkness of night, a faithful horse may be depended upon to lead the way to safety, if allowed to go the way he chooses, for the horse never becomes " turned around " or gets lost.

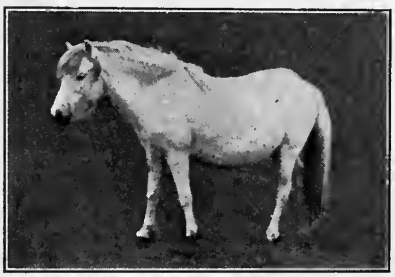
A source of power. — In factories the energy that runs the machinery comes mainly from steam power and water power. On farms most of the heavy work is done by horses. Almost every farmer must have one or more teams of horses to do the plowing, harrowing, harvesting, and the hauling of farm products to market. In the cities also most of the local transportation of goods is done by horses.

Much grain and hay required. — The use of horses for riding, driving, and pulling heavy loads requires the growing of large forage and grain crops to feed these



FRIENDS OF THE FARMER

animals. In the cities the millions of horses create a considerable market for hay and grain.



Shetland Pony

Breeds. — Horses have been domesticated and used by man for many centuries; and many kinds of horses have been developed for different purposes. There are four general classes of horses, — ponies, light horses for racing and riding, carriage horses, and draft horses. To the many well-known breeds should be added a large class of medium-weight horses of no particular breed, which are most used on American farms.

The Shetland and Iceland ponies are used as pets for children. The mustang, Indian pony, and cow pony are used extensively in herding. The principal breeds of light horses are the Thoroughbred, American trotting horse, Kentucky saddle horse, and light, general purpose breeds, as the Hambletonian and Morgan horses. The principal

Carriage Horse

breeds of carriage horses are the French Coach; German Coach; and English Coach, such as the Hackney and Cleveland Bay. The principal breeds of draft horses are the Percheron from France, the Belgian from Belgium, and the Shire, Clydesdale, and Suffold Punch from Great Britain.

Draft Horse

Length of service. — Horses are old enough to be useful at the age of three years; and if well cared for, they will continue to be of service until they are twenty or more years old. When they reach the working age, they are *broken* or put through a course of training which fits them for the work they must do.

The mule, which is a cross between the horse and the donkey, is used as a draft animal. It is able to pull very heavy loads and endure other hard conditions of life.

QUESTIONS

1. What animals are used for power purposes?
2. What qualities make the horse so valuable as a draft animal?
3. What are the four general classes of horses?

4. What are some of the leading breeds of each class? What breeds are raised in your locality?

5. What qualities make the mule a valuable draft animal?

PRACTICAL EXERCISES

1. Obtain from the Agricultural College of your state score cards for judging horses. Get a farmer who is a good judge of horses to help you in this work. (It will not be possible for many schools to make the judging of horses and other animals a part of the regular school work; but by securing the aid of farmers who are good judges of farm animals some useful study of these animals can be made.)

REFERENCES

Write to the Agricultural College of your state for bulletins on horses and other farm animals.

Farmers' Bulletins: 170, Principles of horse feeding; 179, Horseshoeing.

Selected Readings: The Arab to his Favorite Steed, — Caroline Norton; The Blood Horse, —Bryan Waller Proctor; Black Beauty, — Anna Sewell; The Horse Fair, — James Baldwin; Kentucky Belle, — Constance F. Woolson.

LESSON XLVII

CATTLE

Main uses. — Cattle are raised mainly for meat and milk. In a few places they are still used as draft animals. They are raised on nearly every farm, and

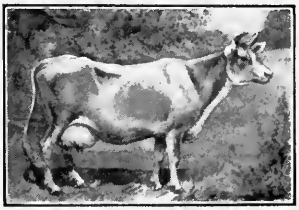
Cattle on Range

in the West great herds of cattle pasture on the wild grasses of the open range. Many people in towns and villages keep one or more cows to supply milk, cream, and butter.

Ayrshire

Guernsey

Galloway



Jersey

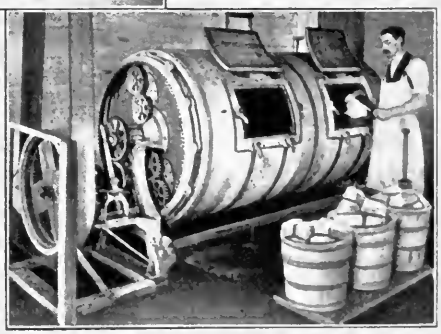
Shorthorn

Hereford

DIFFERENT BREEDS OF COWS

Beef cattle are raised for meat. Some of the principal breeds of beef cattle are Shorthorns, Herefords, Polled Angus, and Galloways. Dairy cattle are raised for milk. The Jerseys, Guernseys, Holsteins, Ayrshires, and Swiss are some of the leading breeds of this class. The general purpose cattle are used for both meat and milk. The Devons and the Red Polled

A Clean Dairy makes Clean Milk



Clean Milk makes Good Butter

cattle belong to this class. In the western grazing states the beef breeds are raised almost exclusively. In grazing districts near our large cities, in the central and eastern sections of the United States, the dairy breeds are kept in large numbers. In the general farming districts the greatest number of cattle belong to the beef-and-dairy types.

Feeds. — Cattle eat pasture grass, hay, and grain.

Cows that give milk are given feeds rich in protein, while beef cattle are fed corn or other grain that contains a good deal of starch and sugar in it. During the growing season cattle should have green pastures to graze, or should be fed succulent plants or soiling crops, such as green clover, alfalfa, and corn. In winter they may be fed corn silage or root crops along with hay and grain. Corn silage is one of the most important winter feeds for milk cows.

Dairy products. — Milk, and the cream, butter, and cheese which are made from milk, are called dairy products; and they are used so extensively that the dairy business is a very important industry.

Other products. — Enormous quantities of beef are used as food, and millions of cattle are slaughtered and converted into beef in the great packing houses of our large cities. The skins or hides of cattle are tanned into leather, which is used to make gloves, boots and shoes, and harness. Sometimes the skins with the hair attached are tanned into robes and overcoats. The skins of Galloway cattle, because of their curly hair, are often used for this purpose. The hair is used in the making of plaster; the horns and hoofs are used in making glue and gelatin; and the bones, blood, and other wastes are used in making commercial fertilizers.

QUESTIONS

1. What are some of the leading breeds of beef cattle? Of dairy cattle?

2. What breeds of cattle are raised on the farms in your locality?

3. What are the leading products obtained from cattle?

4. Under what conditions are dairy cattle more profitable than beef cattle?

5. What farm products are used for the winter feeding of cattle?

PRACTICAL EXERCISES

1. If possible, visit a factory that manufactures one or more dairy products. Study the machinery and methods used in the making of the products.

2. Obtain from the Agricultural College of your state score cards for judging dairy cattle and beef cattle, and get a farmer who is a good judge of cattle to help you judge a dairy cow and a fat steer.

REFERENCES

Farmers' Bulletins: 55, Dairy herd, its formation and management; 71, Some essentials in beef production; 151, Dairying in the South; 152, Scabies of cattle; 166, Cheese making on the farm; 206, Milk fever, its simple and successful treatment; 241, Butter making on the farm; 258, Texas or tick fever and its prevention; 261, Cattle tick in its relation to Southern agriculture; 280, Profitable tenant dairy farm; 348, Bacteria in milk; 349, Dairy industry in the South; 350, Dehorning of cattle; 351, Tuberculin test of cattle for tuberculosis; 439, Anthrax, with special reference to its suppression; 473, Tuberculosis; 498, Methods of exterminating the Texas-fever tick.

LESSON XLVIII

SHEEP AND GOATS

An ancient industry. — For ages the herding of sheep has been an important industry. Before man began to till the soil, the shepherds tended their flocks in mountain pastures, and in dry lands where sheep were the only animals that could live on the scanty pasturage. The shepherds watching their flocks by night on the Judean hills are closely associated with the greatest event in Biblical history. One of the most beautiful bits of literature is the Twenty-third Psalm, which expresses, in terms of the shepherd and the sheep, faith in Divine care.

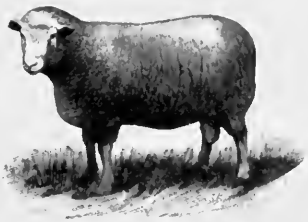
Uses. — Sheep are raised for wool and meat; and the two general classes of sheep are the mutton breeds and the wool breeds. The wool breeds have been developed mainly for wool production. The Merinos are fine-wool sheep; the Shropshire Downs, Oxford Downs, and other Downs are medium-wool sheep; and the Cotswold, Lincoln, Cheviot, and Leicester breeds are long-wool sheep. The Down breeds are also good mutton sheep. The Horned Dorsets are raised principally for the meat of the lambs; the Lincoln and Cotswold breeds are also good mutton types.

Shropshire

Hampshire Down Ram

Oxford Down Ram

Cheviot Ram

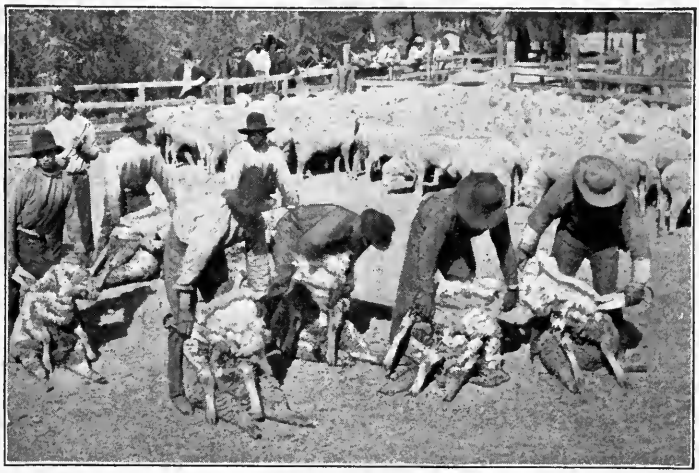


Southdown Ram

Lincoln Ram

DIFFERENT BREEDS OF SHEEP

Wool is the most important of all animal fibers, and is used extensively in the manufacture of cloth and



Shearing Sheep

carpets. The wool is sheared from the sheep in late spring or early summer. On many farms the sheep are washed before shearing; but on the ranges of the Western states, the wool is clipped without washing, and is sent to wool-scouring mills. In the woolen mills it is woven into cloth for clothing, blankets, and other woven goods. The coarsest wool is used to make carpets, and the fibers not good for spinning are made into felt hats and felt boots. The skins of sheep are used to make many kinds of soft leather.

Mutton and lamb. — By many people, mutton is regarded as a choice meat. Fat lamb is especially

prized, and many thousands of lambs are used each year for this purpose. Lambs make more meat for the amount of food eaten than any other animal. The meat is also fatter than that of other animals.

Feed. — Sheep will eat a great variety of feed. Their small mouths and good teeth enable them to bite closer to the ground, and thus to live on shorter grasses than other farm animals. They will eat the leaves and buds of a large number of shrubs and other coarse plants. They may be fattened for market by feeding hay and silage, or corn or other grains, or peas and other legumes.

Sheep Grazing

Root crops, such as turnips and sugar beets, are good food for sheep.

Shelter. — In keeping sheep through the winter it

is important to have them sheltered in dry places that are not too warm. The sheep kept through the winter are mainly breeding ewes, and it is important that they shall not be overfed. Their food should be muscle-forming rather than fattening.

Goats. — In many parts of the world goats are raised on a large scale for milk, meat, and the fleece, called mohair. The milk goat has been called "the poor man's cow." Good milk goats will give from four to six quarts of milk per day, and, considering their size, the yield is greater than that from cows. The milk is considered more healthful than cow's milk and is used to feed young children.

Angora Goat

In the United States goats are not raised extensively, except in a few Southern and Western states. In most localities no goats are seen, except an occasional pet harnessed to a boy's wagon. Texas, New Mexico, and Arizona lead the states in the number of goats.

Angora goats. — Most of the goats raised for commercial purposes are Angora goats, a breed that originated in Asia Minor. These animals are kept to furnish meat, skins, and the long, silky mohair. They will eat coarse weeds, and the leaves and twigs of bushes. This browsing habit makes them useful in cleaning

pastures that are overgrown with brush and weeds. In the South and West, where the climate is hot, the Angoras are sheared twice each year, in the spring and fall. In the Northern states they are sheared only in the spring. The mohair is used to make cloth, plush, and carpets. Much of the plush used on upholstered furniture and car seats is made of mohair. The skins, when tanned with the white, silky hair on them, make beautiful rugs and lap robes.

QUESTIONS

1. What are the two main classes of sheep?
2. What are some of the leading breeds of each class?
3. What are the leading sheep-raising states of the United States? (See Yearbook of Agriculture.)
4. What products are obtained from sheep?
5. What products are obtained from goats?
6. What are the leading goat-raising states?
7. Why is the extensive raising of sheep and goats generally confined to rugged sections of a country?

REFERENCES

Farmers' Bulletins: 49, Sheep feeding; 96, Raising sheep for mutton; 137, Angora goat; 159, Scab in sheep.

LESSON XLIX

SWINE

Raised for meat. — Swine, or hogs, as they are commonly called, are the only farm animals that are raised primarily for meat. Corn is so largely used to feed hogs that the abundance of corn in the United States makes this country the leading swine-producing country in the world. The corn belt of the United States is also the swine section of the country.

Pigs Feeding

Variety of feeds. —Although corn is used almost exclusively to fatten hogs for market, yet these animals will eat roots, tubers, grubs, snakes, nuts, grains, alfalfa, green grass, fruits, and many kinds of kitchen wastes. They will pick up scattered peas, grains, or other seeds which may be left scattered in fields or where other stock are fed. They are the only farm animals that can dig into the soil for food. They

have shovel-shaped noses with which they dig up the ground and gather such things as wild roots, potatoes, artichokes, peanuts, and other underground foods. Because they can eat such a variety of feeds they may often be kept at little cost, and they are sometimes called the "economy animals" of the farm.

Classes of swine. — There are two classes of swine, — the bacon hog and the lard hog. The difference between these two classes seems to have been produced by differences in food. The Yorkshire and Tamworth breeds, which came from England, are bacon hogs. The principal lard hogs are the Poland-China, Duroc Jersey, Chester White, and Essex. The Berkshire, which came from England, is a lard type of hog when fed on fattening foods, but is intermediate when fed on food that has less carbohydrates and more protein in it.

Tamworth

Poland-China

Chester White

Duroc Jersey

BREEDS OF SWINE

Pork constitutes a large part of our flesh foods. The cured meat keeps for a long time, and is easily handled and shipped. The fat of hogs is made into lard which is largely used in cooking. The skins are sometimes tanned into leather, and the hair is used for bristles to make brushes.

In raising hogs it should be remembered that, in addition to proper foods, pure water and clean quarters are necessary to success.

QUESTIONS

1. What is the chief food of hogs? What other farm products are used as food for these animals?
2. What are the two main classes of hogs? Name two or more breeds of each class.
3. What products are obtained from hogs?
4. What are the leading hog-raising states of the United States? (See Yearbook of Agriculture.) Compare this list of states with that of the leading corn states.

REFERENCES

Farmers' Bulletins: 100, Hog raising in the South; 205, Pig management; 331, Forage crops for hogs in Kansas and Oklahoma; 379, Hog cholera; 411, Feeding hogs in the South; 438, Hog houses.

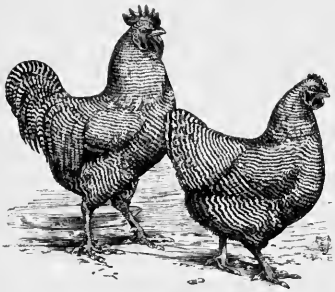
LESSON L

POULTRY

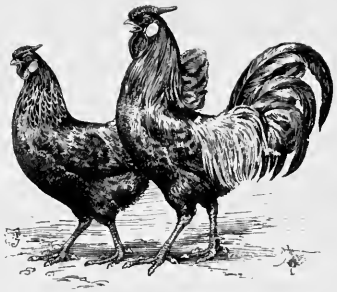
A product of most farms. — On almost every farm one or more kinds of poultry are raised; and there are some large farms whose entire product consists of eggs and fowls. Chickens, turkeys, ducks, geese, peacocks, guinea fowls, pheasants, and other birds raised for eggs, meat, or feathers are called poultry. Even the large ostriches which are kept for their beautiful feathers may be regarded as poultry.

Eggs. — Chickens form about 95 per cent of the poultry of the United States, and their eggs are the leading poultry product. The eggs of turkeys, ducks, and geese are sometimes used for food, but chickens lay more and better eggs than other fowls, and so we seldom find any but hen's eggs in the market.

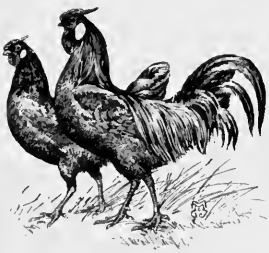
Breeds of chickens. — There are many breeds and varieties of chickens. Some breeds, like the Leghorns and Minorcas, are raised chiefly for their eggs; while others, like the Brahmas and Cochins, are raised principally for their meat. The Plymouth Rocks, Wyandottes, and Rhode Island Reds are American breeds of general-purpose chickens, valuable for both eggs and meat. There are some fancy breeds, like the Bantams, that have little practical use.



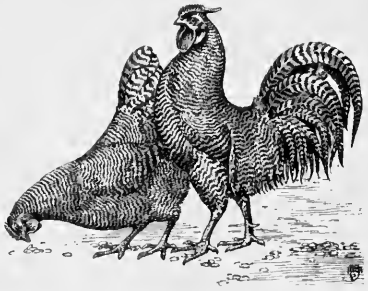
Barred Plymouth Rocks



Rose-comb Brown Leghorns

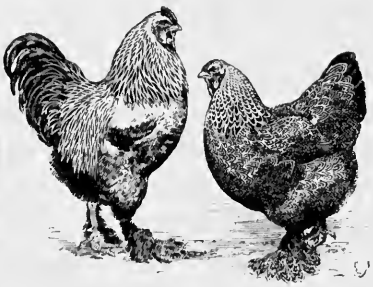


Rose-comb Black Minorcas



American Dominiques

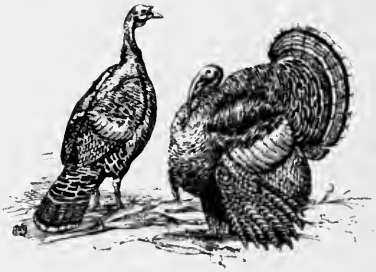
Mottled Javas



Dark Brahmas

BREEDS OF CHICKENS

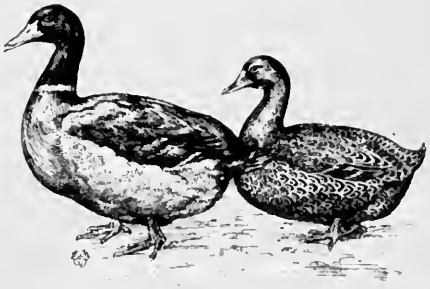
The turkey is one of the finest meat birds in the world. In our country the turkey dinner at Thanksgiving time is one of the important events of the year. These birds are of American origin, and the wild turkey is still found in parts of the United States.



TURKEYS

Ducks and geese are raised for their meat and feathers. They are called water fowls, because they have web feet and swim in the water. They may be successfully raised, however, on farms without ponds or streams.

Pigeons are raised for pets and for food. A full-grown, young pigeon ready for the table is called a squab. Near cities the raising of squabs is an important line of the poultry business.



DUCKS

Poultry raising is light work that may be done by women or children. There is always a good market for the products, and poultry are often the most profitable animals on the farm.

QUESTIONS

1. What birds are included in the term "poultry"?
2. What are the three general classes of chickens?
3. What breeds are raised mainly for eggs? What breeds for meat? What breeds are general-purpose chickens?
4. What breeds are raised in the locality in which you live? What breeds do you know?

REFERENCES

Farmers' Bulletins: 51, Standard varieties of chickens; 64, Ducks and geese; 128, Eggs and their uses as food; 177, Squab raising; 182, Poultry as food; 234, Guinea fowl and its use as food; 236, Incubation and incubators; 287, Poultry management; 355, Successful poultry and dairy farm; 357, Methods of poultry management at Maine Agricultural Experiment Station; 452, Capons and caponizing.

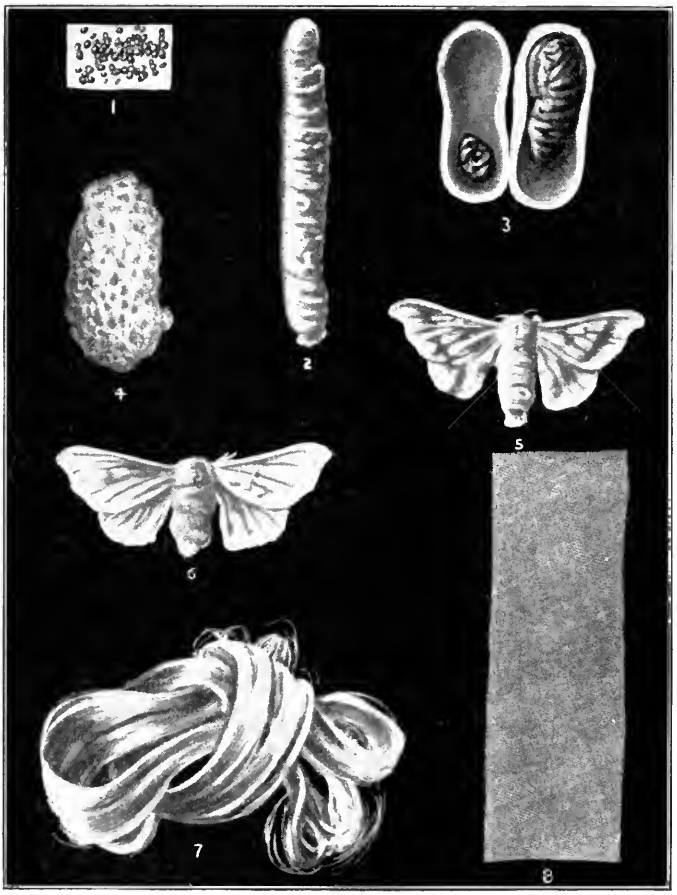
LESSON LI

INSECTS

Honey and silk. — Of the thousands of species of insects, only the bees and silkworms have been domesticated for man's use. Bees are raised for the honey and wax that they produce; and silkworms, for the silk fibers that are woven into beautiful cloth.

The silkworm lives on the leaves of the mulberry tree, and silkworm farming is carried on in regions where these trees grow. The silkworm moth lays eggs in the summer or fall, which hatch the following spring. The worms are fed on mulberry leaves until they spin the cocoons from which we get the silk fibers.

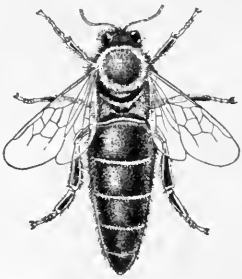
Bee culture is one of the most interesting kinds of farming. It is said that more books have been written about bee keeping than about any other branch of farming. Bees are social insects that live together in swarms. Each hive or swarm consists of a queen bee which is the head of the swarm, the workers or bees that gather the honey, and the drones that do not gather honey. The queen bee lays the eggs in cells made of wax by the workers. In other cells of wax the workers store up honey which is made from the nectar of flowers. The hives now used are made of



1, Silkworm Eggs
2, Fourth Stage Worm
3, Pupa in Cocoon
4, Cocoon
5, Male Moth
6, Female Moth
7, Unspun Silk
8, Woven Silk

lumber and have two or more stories in them. In the lower story the eggs are laid and the young bees raised,

WORKER



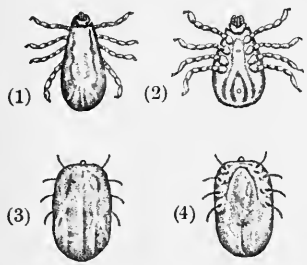
QUEEN BEE

DRONE

while in the upper story the honey is stored. Sometimes the bees in a single hive gather more than 200

BEE FARMING

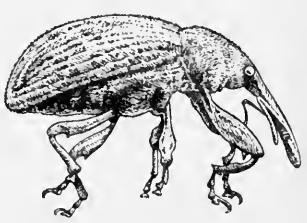
pounds of honey in a season, in addition to that which they need as food for themselves during the winter. Many men, women, and children like to tend bees, finding it both pleasant and profitable work.



Male and Female Cattle Ticks
(Natural Size)

Destructive insects. — Many insects cause great loss by destroying crops, absorbing vitality from animals, and spreading diseases among animals and people; and the destruction or prevention of insect enemies is a very important part of farm practice.

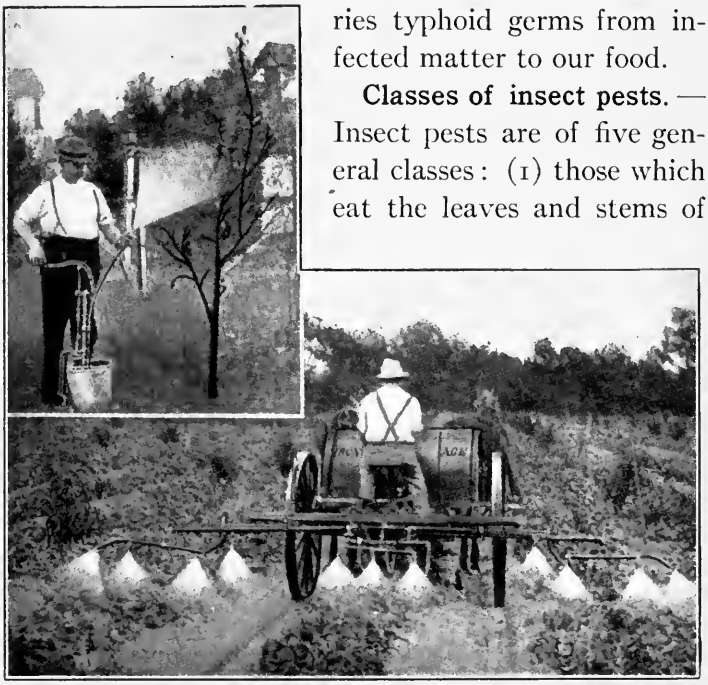
We get an idea of the enormous loss caused by insects when we see the damage done by the Colorado potato beetle, cutworm, Hessian fly, cotton boll-weevil, apple worm, scale insects, and the caterpillars of the brown-tail and gypsy moths. Blood-sucking insects are not only troublesome, but many of them are the carriers of disease germs from the sick to the healthy. Texas fever, which is a serious handicap to cattle raising in the Southern states, is spread by the biting of the cattle ticks. Yellow fever is spread only by the bites of the yellow fever mosquito; and malaria is carried



Cotton Boll Weevil
(Magnified)

by the malarial mosquito. Even the common mosquito is an intolerable pest, although not a carrier of disease. The house fly, now called the typhoid fly, is often the agent that carries typhoid germs from infected matter to our food.

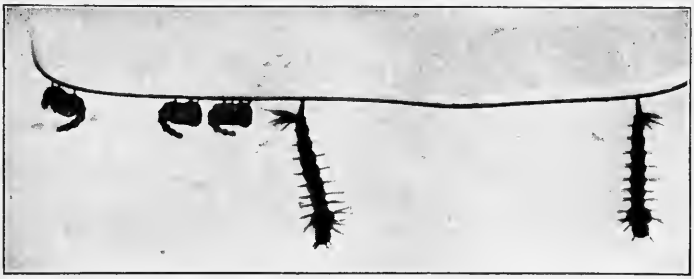
Classes of insect pests. — Insect pests are of five general classes: (1) those which eat the leaves and stems of



Spraying Trees and Vegetables

plants; (2) those which suck the juices of plants; (3) those which bore into plants, feeding on the inside of tree trunks, stems of smaller plants, fruits, and seeds; (4) those which suck the blood of animals; (5) those which are carriers of infected matter.

The leaf-feeding insects and other external feeders can be successfully killed by spraying poisons upon the foliage. By eating the foliage with the poison on the surface these insects are destroyed. The food of the juice-sucking insects cannot be poisoned, and these pests, such as plant lice and scale insects, are killed by poisons sprayed upon their bodies. The soap and



Mosquito Wigglers

petroleum emulsions are effective sprays to kill by contact. The young worms of the codling moth can be destroyed by sprays before they enter the apples.

Mosquitoes. — Another effective method of dealing with insect pests is the destruction of breeding places. Mosquitoes can be prevented by draining marshes and other wet places in which the eggs are laid. The young mosquitoes, which are the wigglers that we often see in standing water, may be easily killed by pouring kerosene over the water.

Destruction of breeding places. — By preventing the access of flies to garbage and stable manure, the

breeding of millions can be prevented. Brush and other rubbish in orchards and forests are the breeding places of many insect pests. The burning of such breeding spots is an extremely effective method of reducing insect enemies of orchards and forests.

Rotation of crops. — Insects that attack one kind of crop may be starved to death by planting another kind of crop on the land. Thus rotation of crops reduces the number of insects. Some crops may be saved from insect attacks by early or late planting. For example, if cotton is planted early, the bolls are formed before the boll weevils have become numerous; and the late planting of wheat saves it from the Hessian fly.

QUESTIONS

1. What are some of the most destructive insects?
2. What insects are useful?
3. What are the most important insect enemies of wheat? Of corn? Of cotton? Of fruit trees? Of shade trees?
4. What are the five classes of insect pests?
5. What disease common to the United States is transmitted by mosquitoes? What tropical disease is transmitted by a mosquito of tropical regions? What other diseases are frequently carried by insects?
6. What cattle disease is transmitted by insects?

PRACTICAL EXERCISES

1. Study the life history of the mosquito by observation. In the fall or spring place a tub of rain water out of doors, and each morning look for floating masses of mosquito eggs. Each mass

of eggs looks like a small flake of soot. In a day or two the eggs will hatch and the tiny wigglers can be seen in the water. Watch the growth of these wigglers. After several days they enter the pupa stage and spend most of the time floating head down from the surface. In a few days the adult mosquito emerges from the old pupa case. The tub should be covered in order to keep in the mosquitoes.

2. In a dish of water containing wigglers add a drop or two of kerosene. Notice how soon the wigglers die. This is the method of destroying mosquitoes on a large scale in marshy land.

3. Destroy the plant lice, other soft insects, and scale insects, which may infest house plants, by spraying with kerosene emulsion. Make the emulsion by dissolving one ounce of soap in a pint of boiling water and then adding one quart of kerosene. Have no fire near when the oil is added. Only a small part of this emulsion is used for a single spraying. For plant lice and other soft insects dilute the emulsion with 15 or 20 parts of rain water before spraying. For scale insects dilute with 10 parts of water.

REFERENCES

Farmers' Bulletins: 397, Bees; 444, Remedies and preventives against mosquitoes; 447, Bees; 450, Some facts about malaria; 453, Danger of general spread of the Gypsy and Brown-tail Moths through imported nursery stock; 459, House flies; 503, Comb honey.

LESSON LII

FOOD OF FARM ANIMALS

Food necessary for growth. — Besides air and water, all animals, as well as plants, must have food in order to live and grow; and the feeding of animals is a large part of the farmer's work.

A food is any substance that can be eaten and used in the body to produce growth and energy. Every animal is provided with automatic indicators of its needs. If it is thirsty, the body needs water; and if it is hungry, the body needs food. The natural appetite tells also what kind of food the body needs. Different kinds of animals require different kinds of food. For example, a horse gets hungry for oats and hay, while such things would not taste good to a dog, because the dog requires meat. Most animals need a variety of foods. A man would starve if fed on bread alone, because it does not contain everything he needs.

Materials in food. — In addition to water, there are four kinds of materials in food; and all animals need these materials in the right proportions. These materials are minerals, proteins, carbohydrates, and fats. The minerals, with the exception of salt, are usually present in sufficient quantities in the natural foods.

Small amounts of salt must be fed to farm animals in most regions. The farmer in the British Isles does not need to give salt to his cattle, for the salt air from the sea gives a saltness to the pasture grasses.

Protein is the part of food that contains nitrogen, and is the muscle-forming substance in food. Albumin in the white of egg, myosin in lean meat, casein in the curd of milk, and gluten in wheat grain are familiar examples of protein. More or less protein is found in all vegetable and animal food products.

Starch and sugar are common examples of carbohydrates. The carbohydrates supply energy to animals, in the form of heat and work. Carbohydrates may be converted by the animals into fat. An animal that fattens easily has the power to convert the sugar and starch of its food into fat.

Fats. — The lard of hogs, the tallow of cattle and sheep, and butter are well-known fats. In vegetable foods there is some fat. Nuts and corn contain considerable fat, and cottonseed oil and olive oil are oily fats. The fat in the grain and other foods has the same use in the body of an animal that starch and sugar have.

A balanced ration for an animal is the right amount of food containing the proper proportions of proteins, carbohydrates, and fat. For example, a cow that weighs 1000 pounds and gives 22 pounds of milk per day ought to eat about 29 pounds (dry weight) of food in which there are 2.5 pounds of protein, 13 pounds of

carbohydrates, and .5 pound of fat. She would get close to this amount and proportion, if she were fed 15 pounds of corn fodder, 10 pounds of alfalfa hay, 10 pounds sugar beets, and 8 pounds wheat bran each day. If she gives more milk, or is a larger cow, she will need more food. Fattening animals should be given feed that contains a high proportion of carbohydrates and fat. Milk contains much protein, and therefore dairy cattle should have feed that contains a greater proportion of protein than that of fattening steers.

QUESTIONS

1. In addition to water, what are the four classes of materials in foods?
2. What foods are rich in protein?
3. What foods are rich in carbohydrates?
4. What seeds used as food contain a large amount of fat?
5. What is a balanced ration?
6. How should the food of a dairy cow differ from that of a fattening steer?

PRACTICAL EXERCISES

1. Place a small quantity of flour in a muslin bag. Knead the flour in a vessel of water until all the starch of the flour is removed. The gummy substance left in the bag is gluten, the protein of wheat.

2. Examine the curd of milk. This is casein, the protein of milk.

2. Crush the seeds of flax and cotton on a sheet of white paper. Note the oily spots on the paper. Note also the oily

feeling of the crushed seeds. From soaked grains of corn remove the germs or embryos and test in the same way for the presence of oil or fat.

3. Make a careful study of bulletins on the feeding of animals and determine a balanced ration for a dairy cow of a definite weight, using feeds produced on farms in your locality. Determine a balanced ration for a fattening steer of definite weight.

REFERENCES

Write to the Agricultural College of your state for bulletins on the feeding of animals.

Farmers' Bulletins: 346, Computation of rations for farm animals by use of energy values.

LESSON LIII

THE FARMER'S FRIENDS

Animal life. — There are many birds, insects, and other animals that are helpful to the farmer. It is wrong to kill wantonly any living thing, and it is a greater wrong to kill animals that serve us only while living.

Uses of birds. — Nearly all birds do far more good than harm. While much can be said against the English sparrow, yet this bird eats large quantities of insects and weed seeds. Crows, blackbirds, and woodpeckers do considerable damage, but by destroying insect pests they do more good than harm. Some of the most useful birds are the quail, kingbird, phœbe, meadowlark, cuckoos, orioles, native sparrows, wrens, chickadee, bluebird, and robin. A great number of other birds may be added to this list. Apart from their usefulness the birds are attractive because of their songs and plumage, and all birds should be protected until it is proved beyond a reasonable doubt that they are more harmful than useful. The damage done by birds in eating fruit and grain is trifling compared with the good done in eating countless millions of noxious insects and weed seeds.

Meadow Lark

Orchard Oriole

Sparrow Hawk

Yellow-billed Cuckoo

Carolina Wren

Some Useful Birds

Useful insects. — Many insects are useful because they destroy a large number of injurious insects. The ground beetles, tiger beetles, mud wasps, ladybird beetles, and ichneumon flies belong to the group of useful insects. The ladybird beetle is of great importance in destroying the San José scale insects that infest the citrus orchards of California. The ichneumon flies destroy the larvæ of moths and butterflies by laying eggs on or in the bodies of the caterpillars. The eggs hatch into small maggots that kill the caterpillars. The bees not only gather honey, but fertilize flowers by carrying pollen from one flower to another. Without this pollination by bees we cannot raise clover seed. Farmers are learning how to make use of friendly insects, and are importing some kinds from foreign countries to help destroy injurious insects.

Toad

The toad is a great friend to the farmer, and especially to the gardener. This animal eats a remarkably large number of cutworms, army worms, caterpillars, gypsy moths, brown-tail moths, rose chafers, wireworms, potato beetles, thousand-legged worms, sow bugs, and snails. Toads are so valuable that they ought to be protected. In gardens, natural shelters should be

made for them, and the thoughtless cruelty of the small boy should be stopped.

QUESTIONS

1. In what ways do useful birds help the farmer?
2. What birds are of greatest value to the farmer?
3. What birds in your state are protected by law? What birds are considered harmful?
4. In what way is the ichneumon fly useful?
5. What service is rendered to the farmer by bumblebees?
6. In what ways are toads useful on the farm?

PRACTICAL EXERCISES

1. Find out by observation what things are eaten by the various species of birds. Make a list of birds that search for food among the leaves of trees; of birds that search for insects in the bark of trees; of birds that catch flying insects; of birds that eat weed seeds; of birds that live on insects and other small animals in the ground.

2. In the fall look for large caterpillars whose backs are covered with small, white cocoons that inclose the pupæ of ichneumon flies. When you find such a caterpillar, keep it in a glass jar until the adult flies emerge from the cocoons. An ichneumon fly laid her eggs in or on the body of the caterpillar. The young maggots that hatched from the eggs fed upon the blood of the caterpillar, and some time before its death they came out to the surface and formed cocoons about themselves. You may find a caterpillar at the time when the maggots are coming out of its body. As you watch, you may see the formation of the cocoons.

REFERENCES

Farmers' Bulletins: 54, Some common birds in their relation to agriculture; 196, Usefulness of the American toad; 456, Our grosbeaks and their value to agriculture; 506, Food of some well-known birds of forest, farm, and garden; 513, Fifty common birds of farm and orchard.

Selected Readings: The Birds of Killingworth, — Longfellow; The Meadow Lark, — Hamlin Garland; Bluebird, — T. B. Aldrich; Song the Oriole Sings, — W. D. Howells; Song of the Toad, — John Burroughs.

LESSON LIV

IMPROVEMENT OF PLANTS AND ANIMALS

Selecting seed. — Each fall the successful farmer goes through his cornfield and selects the seed corn from the best plants in the field. He is sure that the seed from stalks with large, well-filled ears will produce a crop of high yield the following summer. When the forester goes through the forest to select seeds from which to grow young trees, he is careful to gather seeds from only healthy and well-formed trees. He knows that the best trees bear seeds that will develop into good trees, and that diseased or otherwise defective trees will produce seeds that will develop into defective trees. The stock farmer will use only the best animals for breeding purposes, for he knows that "like produces like." Heredity is the law of organic life that causes offspring to resemble the parents. Using this law of heredity the farmer selects seeds of the best plants to produce the next crop, and also chooses only the best animals for breeding purposes. This selection of the best plants and animals to produce a new generation is one of the ways in which improvements of domesticated plants and animals have come about.

Law of variation. — While offspring resemble the parents, yet they are not similar to the parents in every

particular. The law in organic life by which offspring have some difference or variation from the parents is called the law of variation. By methods of breeding that cause variations to become permanent characters, we have obtained beef cattle and dairy cattle, mutton sheep and wool sheep, draft horses and race horses, and many other breeds, each of which possesses some particular advantage.

Environment largely determines the character of plants and animals. For example, on the lower slopes of high mountains, where the climate and soil are favorable, the evergreen trees are large and of good form, while at the upper limit of trees near the snow line the evergreens, although of the same species as those of the lower forests, are only two or three feet high and bushy in form. At this high elevation the hard conditions of life have stunted the trees. The small Shetland ponies are the result of the severe climatic conditions of their native home, the Shetland Islands, of the far north. By making a better environment for the domesticated animals and plants man has greatly improved them. Shelter from severe weather, and the proper amount and kind of food have made the farm animals more serviceable to man than their wild ancestors. By improving the soil man has improved the character of cultivated plants.

Crossbreeding is another method of improving plants and animals. For example, one variety of corn may have one very useful character, and another

variety may have a different useful character; and by a crossing of the two varieties a new variety may be obtained that will possess the two useful characters of both parent varieties. Crossbreeding either of plants or of animals always produces variations, but these variations may be of no value. If there is to be a gain in crossbreeding, the new variation must be an improvement, and must become a hereditary character in the new variety.

QUESTIONS

1. What is the law of heredity?
2. How does the farmer use the law of heredity to improve plants and animals?
3. What is the law of variation?
4. What effect has environment upon qualities of plants and animals? Give examples.
5. What is crossbreeding?

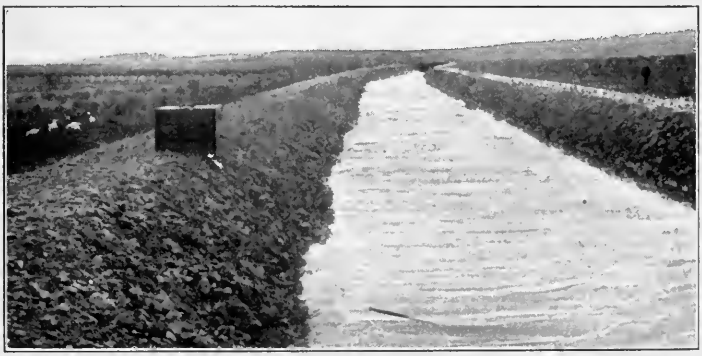
REFERENCES

Write to your Agricultural College for bulletins on animal breeding and plant breeding.

LESSON LV

IRRIGATION FARMING

Irrigation is the application of water to the land in addition to that received by the fall of rain and snow. While irrigation is generally confined to arid and semi-arid regions, yet to a limited extent it is practiced in humid regions. An arid region is usually defined as a part of the country in which the total precipitation for the year amounts to less than fifteen inches of water. A region having an annual precipitation of from fifteen to twenty-five inches is regarded as semiarid land. The term "precipitation" includes rain and snow, ten inches of snow being equal, on an average, to one inch of rain.



Irrigating Canal

Systems of irrigation. — The most common irrigation system consists of a dam across a stream from which the water is taken, a canal that leads the water to the area to be watered, and the laterals or small ditches through which the water is brought from the canal to the farms. The dam across the stream may simply divert part of the water into the canal, or it may be so large that it converts a part of the valley on the upper side into an immense reservoir in which the flood waters may be stored for irrigation purposes.

Methods of applying water. — There are several methods of applying water to the soil. The kind of crop, the size of the irrigated area, and the character of the soil and surface are important factors that determine the method of applying the water.

In *aërial irrigation* the water is distributed by pipes and sprinklers. Lawns are commonly so watered. Orchards, gardens, and greenhouse benches are often subirrigated; that is, by underground pipes or tiles the water is carried to the soil around the roots of the plants.

Pasture grasses and hay and small grains are usually irrigated by *flooding*. The water is run directly over the surface and around the growing plants. In furrow irrigation the water is run in furrows between the rows of trees or other plants. This is the method by which orchards, corn, potatoes, and garden vegetables are usually watered.

On very level land, basins are formed by throwing up ridges of soil. A basin may be a small one around each tree in an orchard, or it may cover one or more acres of a field. When the plants need water, it is allowed to flow into the basins from the ditches or laterals. This method is called *basin irrigation*. In check irrigation ridges of soil are thrown up across a field to check and guide the water that flows over the surface from the lateral. This method, called check irrigation, is a modification of flood irrigation. There are several modifications of each of these methods.

Irrigating Fruit Trees

Irrigation in ancient times. — Irrigation farming has been practiced since very ancient times. In Egypt, thousands of years ago, there were irrigation works, and the annual overflows of the Nile also irrigated large areas in the river valley. In the southwestern part of the United States, long before the discovery of America

by Columbus, the native people had large irrigation systems. The first irrigation in this country in modern times was done by the people of Utah in 1847, when the water of City Creek was used to irrigate the gardens near Great Salt Lake. At the present time several millions of acres in the United States are farmed by irrigation, and great irrigation works are being constructed for the reclamation of more land.

In Japan, raising crops by irrigation has been practiced many years, although the annual rainfall amounts to as much as forty inches. In parts of our own country, where the rainfall is thirty-five or forty inches, some farmers are adopting irrigation to supplement the rainfall. In the intensive growing of fruits and vegetables in market gardens, an irrigation system may often save the crops in dry seasons.

QUESTIONS

1. What is irrigation?
2. In what sections of our country is irrigation carried on extensively?
3. What other countries practice irrigation?
4. What are the main parts of an irrigation system?
5. By what methods is water distributed to the crops?

REFERENCES

Farmers' Bulletins: 138, Irrigation in field and garden; 158, How to build small irrigation ditches; 263, Practical information for beginners in irrigation; 392, Irrigation of sugar beets; 399, Irrigation of grain; 404, Irrigation of orchards.

LESSON LVI

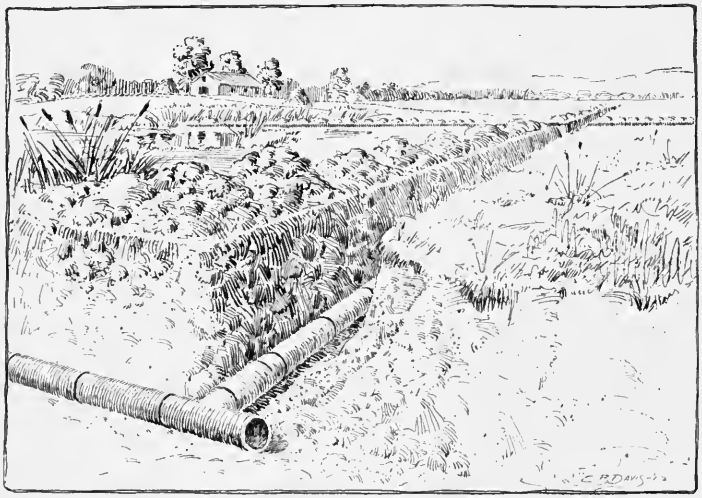
DRAINAGE

Importance of drainage. — Farm land should be well drained in order to be highly productive. At one time it was thought that drainage was useful only in removing the surface water from low ground. After some time the farmers realized that underdrainage is valuable even on lands that have good natural drainage.

Underdrainage. — A ditch for underdrainage is made by digging a trench from two to four feet deep and with sufficient slope that water will readily flow to lower levels. On the bottom of the trench drain tiles are placed end to end to form a continuous tube, and then the trench is filled with earth. The depth of the ditch puts the tile beyond the reach of the plow and frost and permits the draining away of the ground water to the proper depth. The water enters the tube through the spaces between the ends of the tiles.

Effects of drainage. — Drainage not only helps the crop by removing the free water from the soil, but also aids it to survive a drought. In undrained land the ground water lies near the surface until dry weather sets in, and the root system of the crop will be confined to the shallow layer of soil above the water line. If a long dry period sets in, the ground water sinks to a

depth of several feet, and the plants with their roots near the surface will suffer from the drought. In land with proper underdrainage the ground water is not near the surface at any time, and the roots of the crop sink deeper into the soil and thus have a greater depth of soil from which to get the food materials; and the



Drain Tiles

greater root depth also enables the plants to get a larger supply of moisture during a dry season.

Roots need air. — It must be remembered that the roots of plants need air, and that free water in the soil excludes the air. In drained soils, as the water passes from the soil into the ditch the air enters the pores of the soil to replace the water. Thus good drainage admits air to the soil and roots.

Drainage and warmth. — A wet soil becomes warm more slowly than a dry soil, for the water in the soil takes up so much of the sun's heat. Drainage, by removing the surplus water, hastens the warming of the soil in the spring.

Swamp lands. — In many soils that are irrigated, drainage is necessary. An application of water may so saturate the soil that unless there is good drainage, it becomes unproductive. In the United States there are still extensive areas of swamp lands that may be converted into fertile farms by draining away the water.

QUESTIONS

1. What are the advantages of having the soil well drained?
2. In your locality how much of the land is unproductive because of poor drainage?
3. How does underdrainage help crops to survive a drought?
4. Why does a drained soil become warm earlier in the spring than a wet soil?
5. What things determine the depth at which a tile ditch should be placed?

PRACTICAL EXERCISES

1. Draw a map of the farm on which you live, showing the location of the ditches.
2. Visit a tile factory and study the operations in the manufacture of tiles.

REFERENCES

Farmers' Bulletins: 187, Drainage of farm lands; 371, Drainage of irrigated lands.

LESSON LVII

DRY FARMING

Farming in semiarid regions. — In the eastern half of the United States the rainfall of from twenty-five to sixty inches is sufficient for successful agriculture by common methods. In semiarid regions, where the rainfall amounts to from fifteen to twenty-five inches, the production of profitable crops is quite uncertain under the ordinary farm practice. To raise crops without irrigation in these regions requires special methods of tillage and special kinds of crops. The growing of drought-resistant crops by tillage methods that enable the soil to gather and hold the largest possible amount of moisture is *dry farming*.

Soil moisture. — There are three ways by which the soil loses the moisture it receives from rain and snow. A large part of it sinks into the ground and passes away by drainage, part of it comes to the surface and evaporates into the air, and another part is taken up by the growing plants and transpired into the air from the leaves.

Methods of retaining soil moisture. — To secure and retain the largest possible amount of soil moisture from rain and snow, the following operations are carried on in the dry-farming belt.

(1) Plowing the soil deep and pulverizing it to obtain a fine, loose texture, so that the soil will absorb all the moisture that falls as rain or snow.

(2) Compacting the subsoil, if it is very loose, so that the soil particles, by lying closer together, will enable water from below to rise within reach of the roots of the growing crops.

(3) Stirring the upper three or four inches of soil so that it acts as a blanket or mulch to prevent the moisture from reaching the surface where it would evaporate into the air.

(4) Keeping down all weeds, which take up moisture from the soil and by transpiration allow it to pass into the air.

(5) Tilling the land during one season by these special methods before planting the crop. By this system the crop gets practically all the moisture that comes to the land in two seasons instead of one, and the farmer has only one half of his land in crop each year.

(6) Adding vegetable matter to the soil, which will help to absorb and hold water as well as add food materials for plants.

Plants suitable for dry farming. — The second part of dry farming is the growing of plants that can be raised with a small amount of water. Our most drought-resistant plants are those that have been produced in the semiarid region of our own country or have been brought from other dry countries. Some of

DRY GROWN WHEAT

these are durum or macaroni wheat, spring and winter emmer, Kafir corn, milo maize, sweet clover, and brome grass.

Dry farming an important method. — Dry farming has been practiced in parts of the West for a number of years, and is now being made a special study by farmers in all parts of the arid and semiarid sections of the country. Through these methods much land that was not adapted to farming under old methods has come under cultivation, thus greatly increasing the whole farm area of the country.

QUESTIONS

1. What is dry farming?
2. By what methods is sufficient water stored in the soil?
3. In what section of our country is dry farming carried on?
4. What are some of the drought-resistant crops?
5. Why are large farms necessary in the dry-farming region?

REFERENCES

If you live in the dry-farming section, write to the Agricultural College of your state for bulletins on dry farming. Yearbook of Agriculture, 1911: Some misconceptions concerning dry farming, pp. 247–256; The water economy of dry-land crops, pp. 351–362.

LESSON LVIII

BEAUTIFYING THE HOME GROUNDS

Importance of beautiful surroundings. — Every one who has driven along country roads has felt the gloom of ugly homesteads, and also the charm of beautiful farm homes, many of which are less expensive than the ugly places. Every farm home can be made more beautiful by planting trees, shrubs, vines, flowers, and grass. It requires a little time and thought, but almost no money, to transform an ugly place into an

An Unattractive Farm House

attractive one. Not only does the beauty of farm surroundings add to the happiness and healthfulness of farm life, but it gives also a distinctly higher market value to any farm.

Neatness. — Very much of the disorderliness of a farmstead is due to a poor arrangement of farm buildings. For example, a yard in which live stock have free range should never be placed between the house

TREES AND SHRUBS GIVE THE HOUSE A MORE PLEASING APPEARANCE

and barn. A miry barnyard between the house and barn is not only unsightly but inconvenient and dirty. Neatness, too, is one of the necessary conditions to beauty of surroundings. Broken fences and gates should be promptly repaired; and ashes, tin cans, and other rubbish should not be allowed to accumulate near the house.

Lawns. — A grassy lawn is one of the most important features of a homestead. The lawn should be smooth, well drained, and covered with a carpet of grass. Poultry are a common cause of unsightly house yards. To prevent grass plots and flower beds from being converted into dust baths, and to insure clean walks, chickens and other poultry should be excluded from the lawn.

Shrubbery. — The selection and placing of shrubbery and flowers should be done with good taste. Lawns should not be overcrowded with flower beds and shrubs. A good place for flowers is along the foundation of the house and the border of the walks. Sometimes a pleasing effect can be obtained by filling an angle at the side of a house with flowering shrubs or small evergreen trees closely massed together.

Windbreak of Trees

Trees around a homestead serve for beauty, shade, and protection against storms. In localities where high winds are frequent, a shelter belt of trees is planted on the windward side of the house, and adds much to the attractiveness of the place. For shade and beauty some of the fruit trees serve well. In such trees as the apple tree there is a high degree of beauty and utility combined.

Paint is an important factor in beautifying the farmstead. Some buildings are unsightly for lack of paint, and others are distressingly ugly by reason of the color of the paint, or the use of several colors that lack harmony. No farm home should be vulgarized by glaring advertisements spread over the side or roof of a barn.

You can help. — Boys and girls can do much to beautify their home surroundings. They should always keep in mind that it costs little to make the homestead attractive; and that beauty, usefulness, and healthfulness belong together.

QUESTIONS

1. What are some of the things that make ugly surroundings on a farm?
2. What are some of the advantages of beautiful surroundings?
3. By what means may a good lawn be secured?
4. What are some of the disadvantages of an overshaded lawn?
5. What plants serve well for beautifying a farmstead?

PRACTICAL EXERCISES

1. Make a plan of a farmstead, showing the location of house and lawn, well, barn, sheds, garden, orchard, lots, driveways, and walks.
2. Draw a planting plan for a lawn, showing the location of trees, shrubs, flowers, walks, etc.
3. Draw a plan of the most beautiful farmstead in your locality.

REFERENCES

Farmers' Bulletins: 185, Beautifying the home grounds; The lawn; 494, Lawn soils and lawns.

LESSON LIX

THE FARM HOME

Home. — A home should be more than a place of shelter. It should be also a place of inspiration, joy, and peace. The home is the foundation of civilization, because it helps us more than any other agency to secure vigorous and good character.

Modern conveniences in the country. — We are apt to get wrong ideas of the so-called advantages of city life. All the modern conveniences of city houses are going into farmhouses, thus increasing the comfort and healthfulness of these homes. The loneliness of farm life has largely disappeared by reason of good roads, electric railroads, rural mail delivery, and telephones. The abundance of fresh air and ground space, the freedom from the dust and noise of streets, the inspiration of close contact with nature, and the opportunity for quiet study and reading are some of the best features of home life on the farm.

Window plants can add much to the beauty of the home. Caring for these plants and watching their growth will furnish many pleasant hours. Geraniums, begonias, and heliotropes can be started easily from cuttings. For foliage the English ivy and many of the ferns are desirable house plants. The tulip, hyacinth,

and narcissus are good bulb plants for winter blooming and are easily grown.

House plants need rich soil with good drainage. The air should not be too hot and dry. In most houses the air is too dry for the health of plants and people. Care must be taken to keep them well watered and free from insects and fungous diseases.

Window Plants beautify the Home

Importance of beautiful surroundings. — The advantages that come from the isolation of each farm home may become disadvantages, if the proper home conditions do not exist. There may be a bitter monotony in farm life, if the surroundings are ugly, and if the spirit of the home is harsh and unkind. Some farmers do not realize the value of beautiful houses with pictures, music, and books, and they miss much of the pleasure and inspiration that otherwise they would enjoy.

Peace in the home. — The spirit of the family that lives in the house determines more the character of the home than the house and surroundings do. Nearly

all the work of the family is done on the farm, and the members of the family are together more than the members of many families in the city are. The close association during hours of work and recreation is a blessing, if love prevails in the thoughts, words, and acts of each one in the family.

The ideal farm home is one in which, to the naturalness and independence of farm life, there are added good manners, correct speech, and the high virtues that have given character to the best American homes.

QUESTIONS

1. What are some of the advantages of farm life over city life? What are some of the disadvantages?
2. What conveniences do we now have, that make farm life more attractive?
3. Of what value are books and pictures?
4. Do the farmers in your community have proper regard for the things that develop real culture in their homes?

REFERENCES

Farmers' Bulletins: 126, Practical suggestions for farm buildings; 270, Modern conveniences for the farm home.

Selected Readings: Little Brown Hands, — Mary H. Krout; Snowbound, — J. G. Whittier; Being a Boy, chapters III, XI, XII, XIII, — C. D. Warner.

LESSON LX

THE CALL TO THE FARM

FARMING is one of the most pleasant occupations. Nearly everybody is interested in the cultivation of the soil and in the raising of animals. Indeed, there seems to be a natural longing to work with the soil, which comes to every one sometime during his life.

Farming demands intelligence. — The farmer works with living plants and animals and with all the natural forces in soil, air, water, and sunshine that affect the growth of plants and animals. Boys and girls should fully realize that the farm offers a good field for the exercise of all the skill and scholarship that they can attain. Although farming is a special business that requires broad and thorough knowledge, yet one may do fairly successful work on the farm while he is learning the underlying principles of the science and art of agriculture.

A desirable occupation. — There has been a false impression that tilling the soil is a hard and low kind of labor. Nothing could be further from the truth. Great minds in all ages have considered farming a most desirable occupation. All accomplishment comes through some form of labor; and labor becomes a

pleasure and an inspiration when one does his work with interest and intelligence. Work is wholesome, and no other kind of work leads to longer, happier lives, and greater development of mind and body than of producing useful things from the soil.

Modern conveniences. — Farming is continually becoming more pleasant and more profitable. It is not necessary to work longer hours, or do more work than in other walks of life. With the growth of knowledge and the development of machinery and methods, which enable the farmer to do more work with less effort, there is more inducement to lead this kind of life. In these modern times the successful farmer can build a house that has every convenience and luxury to be found in the best city house. He can produce larger and better crops with less labor than formerly, and has as much or more leisure for study and pleasure.

Living close to the soil. — In short, the people on the farm feed and clothe the world and do much to supply it with strong men and women of force and virtue. The hope of the world is greatness of character. Living close to the soil and in harmony with nature makes for that simplicity which is greatness. Any one who decides to be a farmer may well be proud of the life work he has chosen.

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