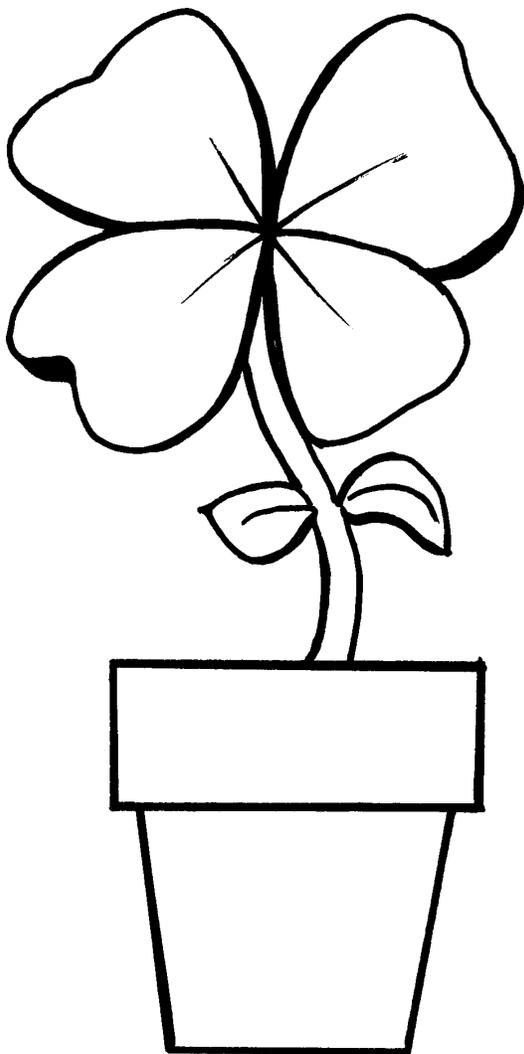




LIT. NO. 300  
4-H Member Guide

# PLANT SCIENCE



HORTICULTURE

FIELD CROPS

# WELCOME TO 4-H PLANT SCIENCE UNIT 1

Joe M. Maxson  
4-H Specialist - Plant Science

Plants are important to us in many ways. In this unit you will learn many things about plants.

WHEN YOU HAVE COMPLETED THIS UNIT YOU SHOULD BE ABLE TO:

- 1. Tell how man depends on plants.
- 2. Tell the difference between field crops and horticulture.
- 3. Tell what the word “horticulture” means.
- 4. List the four areas horticulture can be divided into.
- 5. List four jobs important to each area.
- 6. Name three groups of field crops.
- 7. Name three crops or products from each group.
- 8. Name five major parts of a plant and one function of each part.
- 9. Name the parts of a seed.
- 10. Test seed for germination.
- 11. Plant a seed flat.
- 12. Transplant a seedling.
- 13. Name two of each of the following:
  - Vegetables in which leaves are eaten.
  - Vegetables in which roots are eaten.
  - Vegetables in which flowers are eaten.
  - Vegetables in which seeds are eaten.
  - Plants in which seeds are ground to make food.
  - Field crops used for food.
- 14. Grow vegetables in containers.
- 15. Tell what “plant pathology” is.
- 16. Tell what disease of a vegetable caused the Irish Famine.

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NOTE: You may place a check in the box when you have completed each of the above objectives.

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The above list looks like a lot to learn, doesn't it? But you can do it. 4-H is a family effort. Ask mom and dad or older brothers and sisters to help you get started on the different activities.

Your 4-H leader and older 4-H members can also help you get going in the right direction -- and don't forget your teacher at school. Many of the things you will be doing in 4-H plant science can also be activities for a science class.

**GOOD LUCK AND HAVE FUN !**

Electronically formatted by Mark S. Gregory  
Area Extension Agronomy Specialist

# 1. Man Depends On Plants In Many Ways

Much of our food comes directly from plants.

Wheat for flour, cereal crops, vegetables, fruits, nuts.

Plants produce feed for animals.

Pasture, feed, grain, hay.

Plants provide enjoyment for every day living.

House plants, shade trees, lawns, golf courses, flowers.

Plants provide fiber from which many products are made.

Cotton, lumber, paper.

Plants provide oxygen for people and animals to breathe.

## 2. Field Crops - Horticulture

This unit is for 4-H members enrolled in Field Crops and Horticulture. In many ways they are alike:

IN BOTH FIELD CROPS AND HORTICULTURE YOU LEARN:

- \* About plants and how they grow
- \* How to start new plants
- \* How food is produced

However, there are some differences in Horticulture and Field Crops:

### Field Crops

Usually includes larger farms that produce such crops as wheat, peanuts, cotton, and feed grain.

Includes livestock feed and fiber crops as well as crops used for human food.

### Horticulture

Includes flowers, vegetables, landscaping, nursery, fruit and nut production.

Also includes small gardens, greenhouses, nurseries, orchards, and vegetable farms.



### 3. Horticulture

MAY BE A NEW WORD TO YOU. WHAT DOES IT MEAN?

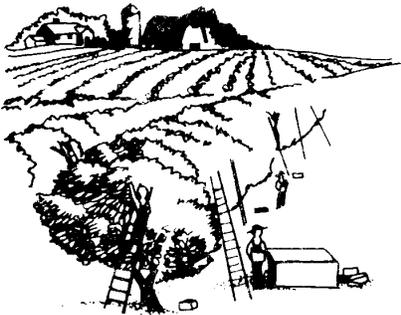
The word horticulture comes from two Latin words, “hortus” meaning garden, and “culture” meaning cultivation. Horticulture then means culture of the garden. It includes learning to grow different kinds of crops. There are many kinds of activities for you to enjoy while you are learning about horticulture.

### 4. Horticulture Has 4 Major Areas:

(There are many jobs and activities in each area.)

#### Fruit and Nut Growing

home fruit and nut growing  
orchards  
vineyards  
canning factories  
freezing factories  
spraying  
pruning  
harvesting



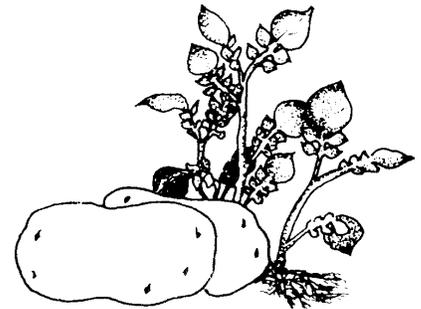
#### Floriculture

flower production  
greenhouse operator  
flower arrangement  
flower shop owner  
salesman  
greenhouse worker  
propagation



#### Vegetable Growing

home vegetable growing  
vegetable farms  
vegetable canning factories  
vegetable freezing factories  
buying and selling vegetables  
harvesting vegetables  
greenhouse vegetable growing  
growing vegetable plants



#### Ornamental

landscape design  
garden center operator  
lawn care service  
nursery stock production  
garden center worker  
nursery worker  
tree care service  
pruning and spraying



## 5. More About Field Crops

Field crops can be divided into three groups or divisions:

### Food Crops - Used as human food

wheat  
rice

corn  
oats

barley  
peanuts

cotton  
soybeans

### Feed Crops - Used as animal feed.

corn  
wheat  
grain sorghum

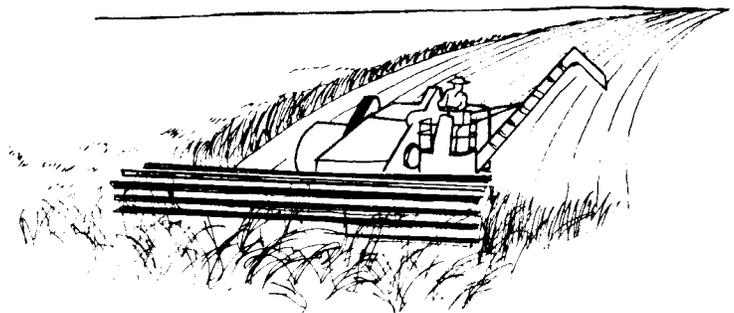
cotton  
soybeans  
cotton

### Fiber Crops - Used to make cloth or other materials.

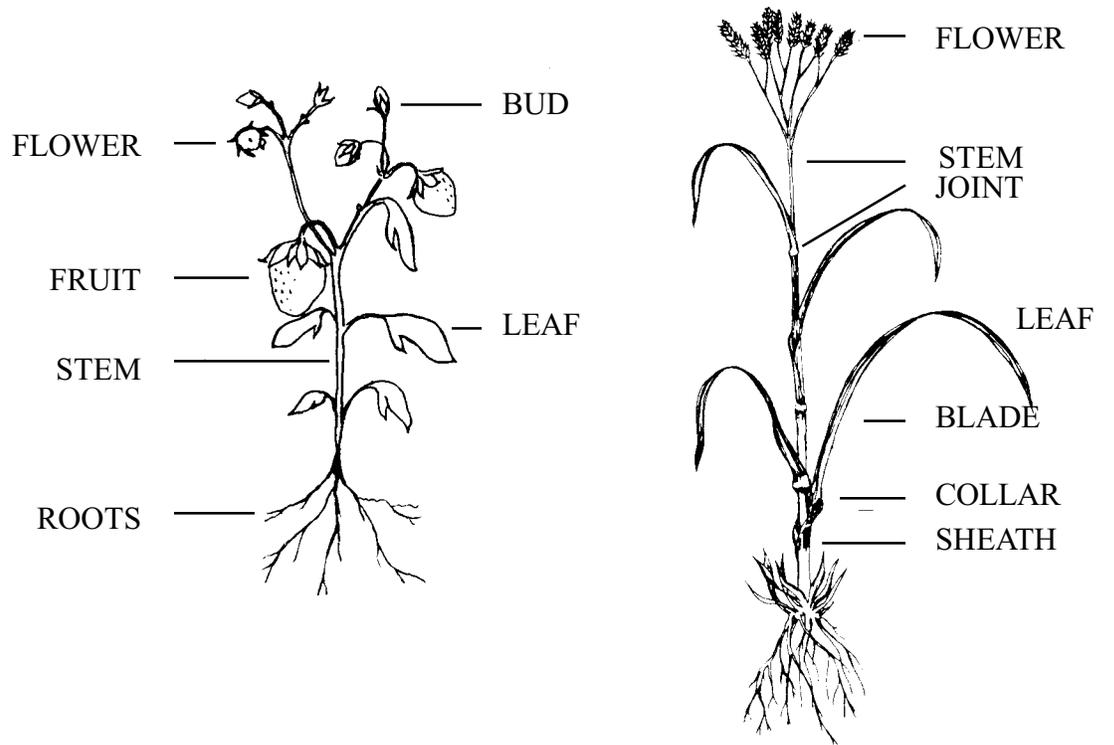
cotton  
flax

broom corn  
hemp

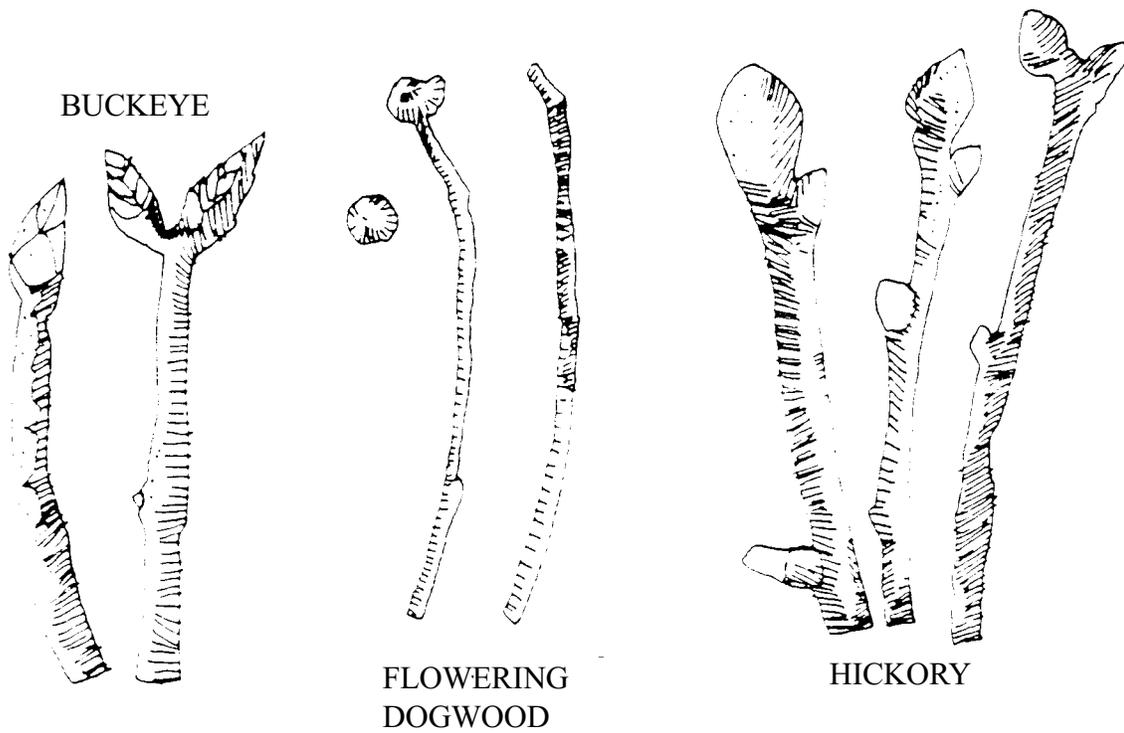
NOTE: You will notice that several crops are listed in more than one group-an example is cotton, which is used for: (1) making cloth; (2) cotton seed meal is a livestock feed; and, (3) cotton seed products are used in human food.



## 6. Parts Of A Plant

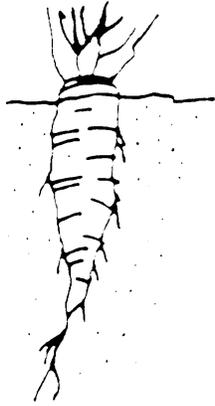


**Buds** may be flower buds or leaf buds. Flower buds produce the flower. Leaf buds produce leaves or new limbs.

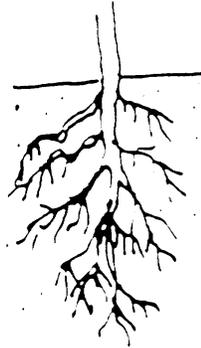


The ROOT'S job is to take water and minerals from the soil for the plant to make food. The roots also provide support for the plant. Roots may be in many different sizes and shapes. Some are used for food like carrots or turnips.

FLESHY TAP ROOT



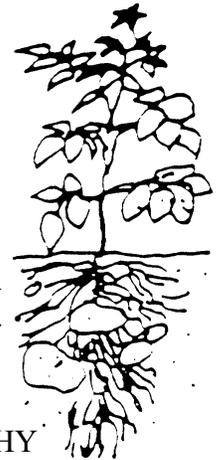
BRANCHED TAP ROOT



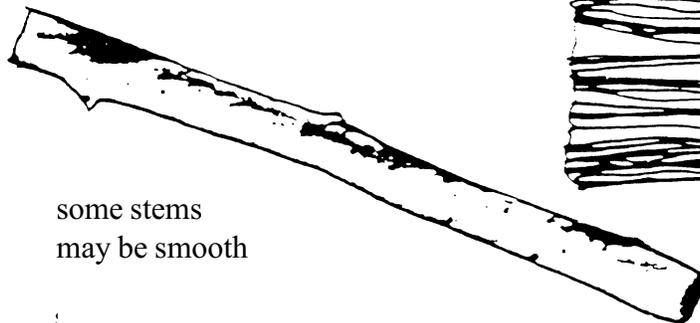
FIBROUS ROOTS



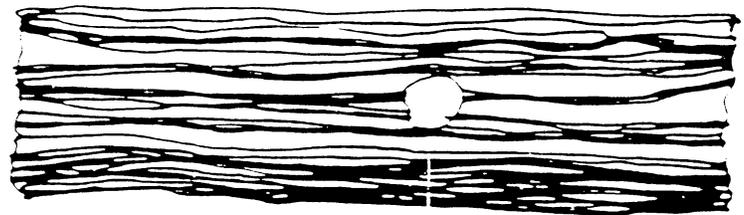
FLESHY TUBEROUS ROOT



The STEM is that part of the plant that comes up from the soil. On large plants like trees, this stem is called the trunk. This stem or trunk has smaller stems limbs, and leaves attached to it. The flower and fruit will also be attached to the stem at some point. This main stem moves water and minerals from the roots to other parts of the plant. It also returns food to be stored in the roots. We eat the stems of the asparagus plant.



some stems may be smooth



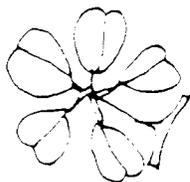
some stems may have rough bark

The LEAF has a very important job. It must make food for the entire plant. When the sun shines on a leaf, it takes carbon dioxide and the water that's already in the plant to make sugar. Chlorophyll in the leaves help make this possible. As this food is being made, the plant gives off oxygen which is important to animal life. This is a process known as photosynthesis that you will learn about in Unit 11. We eat the leaves of leafy green vegetables, such as spinach and lettuce. We eat only the leaf stem (Petiole) of the rhubarb plant. There are many different kinds of leaves.

LEAF TYPES



SIMPLE



PALMATELY COMPOUND



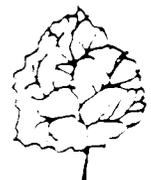
PINNATELY COMPOUND

LEAF VEIN TYPES



PARALLEL VEINS

NETTED VEINS



The FLOWER has many functions or jobs. Some plants are grown for the beauty of the flowers or for their good odor. Bees use pollen from flowers to make honey. The main function of the flower is to become pollinated so a fruit can grow and other plants can be produced from its seed. We eat the flower of some plants such as broccoli and cauliflower.



DOGWOOD



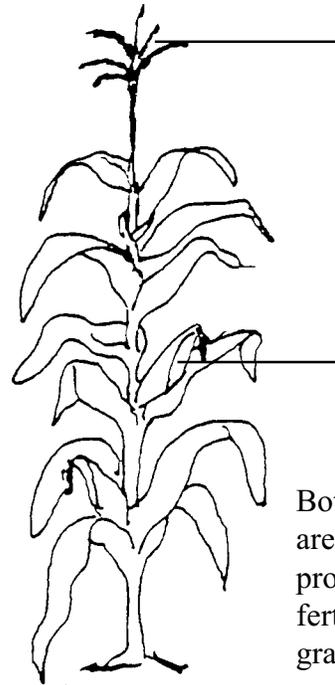
GERANIUM



ROSE



ORCHID



TASSLE

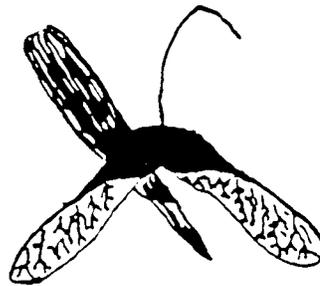
EAR

Both TASSLE and EAR are flowers. (the tassel provides the pollen that fertilizes the ovary and a grain of corn is formed).

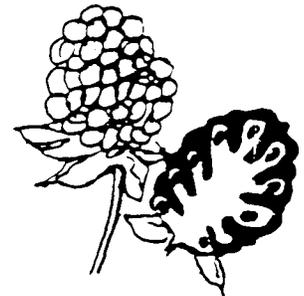
The FRUIT of different plants may take many different forms -the fruit contains the seeds that we can plant to get new plants. Many plants produce a fruit as the edible product e.g., apple, peach, tomato.



BEAN



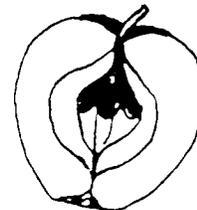
MAPLE



BERRY



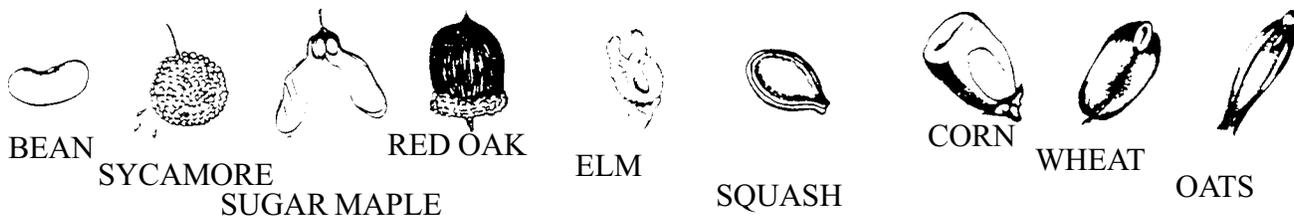
COTTON



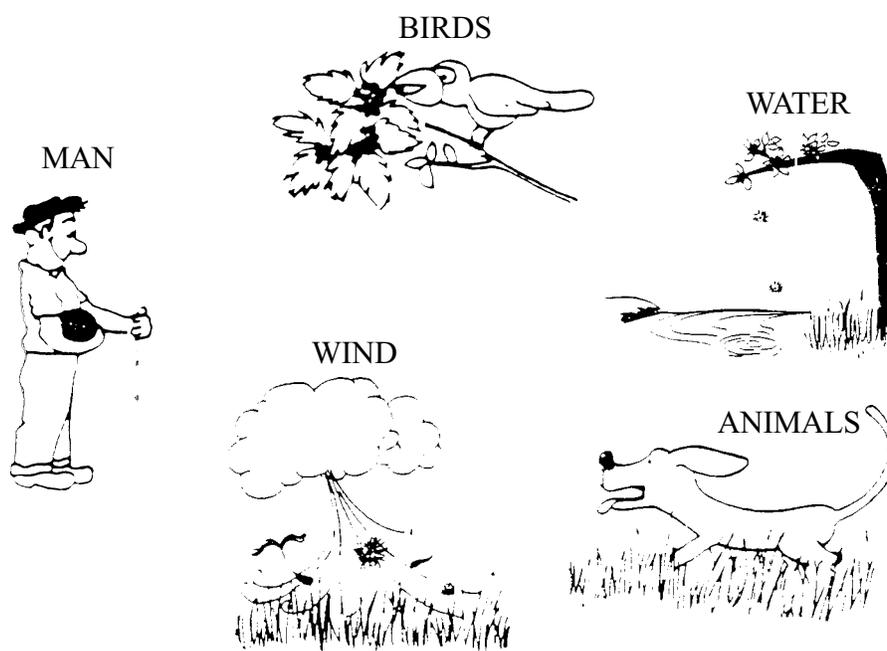
APPLE

## 7. More About Seed

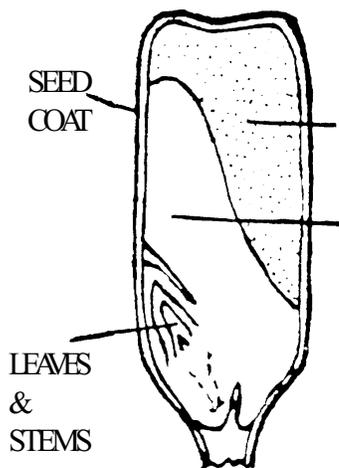
Seeds are very important to us. As you have already learned, they may be the part of the plant we use for food. Beans and corn are examples of seeds we eat for food. Seeds are also the way many new plants get started. Seeds have many different shapes.



### SEEDS ARE SCATTERED IN DIFFERENT WAYS



### Let's Learn The Parts Of A Seed:



CORN

STORED FOOD

EMBRYO

SEED COAT

EMBRYO

STORED FOOD

BEAN

SEED COAT

EMBRYO

STORED FOOD

PEA

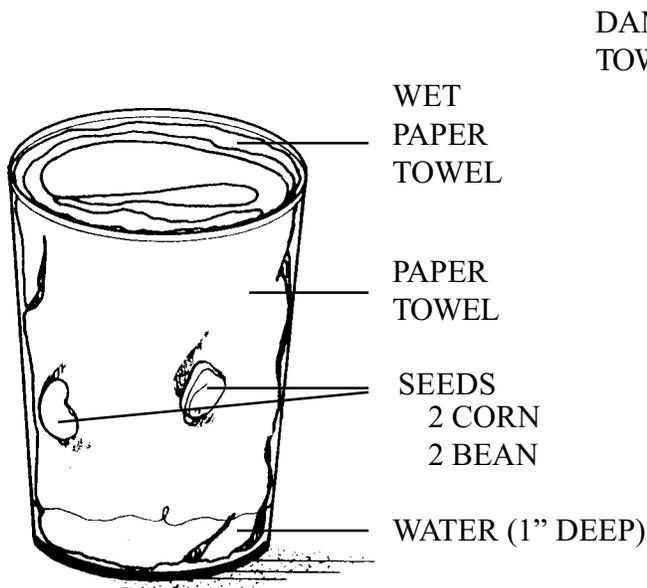
A seed is a very small plant which is resting rather than actively growing. The embryo is the small plant. The endosperm is stored food, and the seed coat is a protective covering.



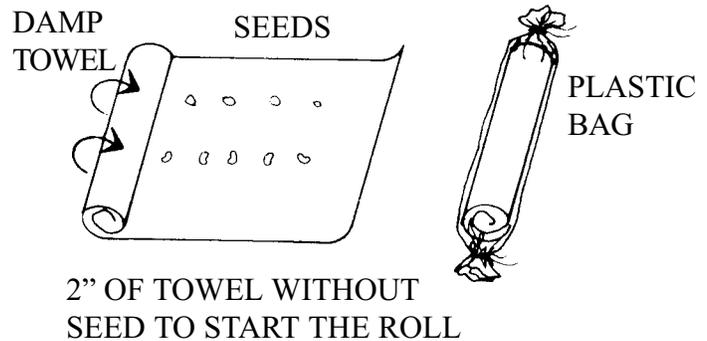
## Starting New Plants From Seed (Germination)

When a new plant starts to grow inside a seed and breaks out of the seed coat, it is called germination or sprouting. Different seeds have different requirements for germination. There are some seeds, however, that you can germinate in your room as an experiment. Try the methods of testing seed germination below. Corn, bean, or pea seed are good to use in these experiments.

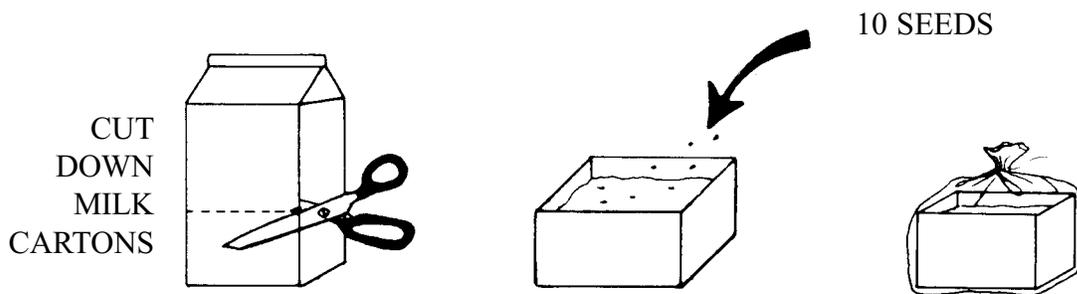
### Glass & Paper Towel Method



### Rag Doll Method



Use a damp towel and place in a plastic bag when finished. Check daily and look for seed swelling or germinating.



These tests will allow you to see newly germinated seeds and see if the seeds are still good. Old seed that has not been properly stored will not germinate.

You can also check seed germination by planting seed in a container of soil. Water the soil and place in a clear plastic bag. (Be sure the container has drainage holes in the bottom.)

## 8. Let's Grow Some Plants.

### **PLANTING A SEED FLAT:**

(A container in which seed is planted is called a flat.)

**Container** - Any container will work that is at least two inches deep and has drainage holes.

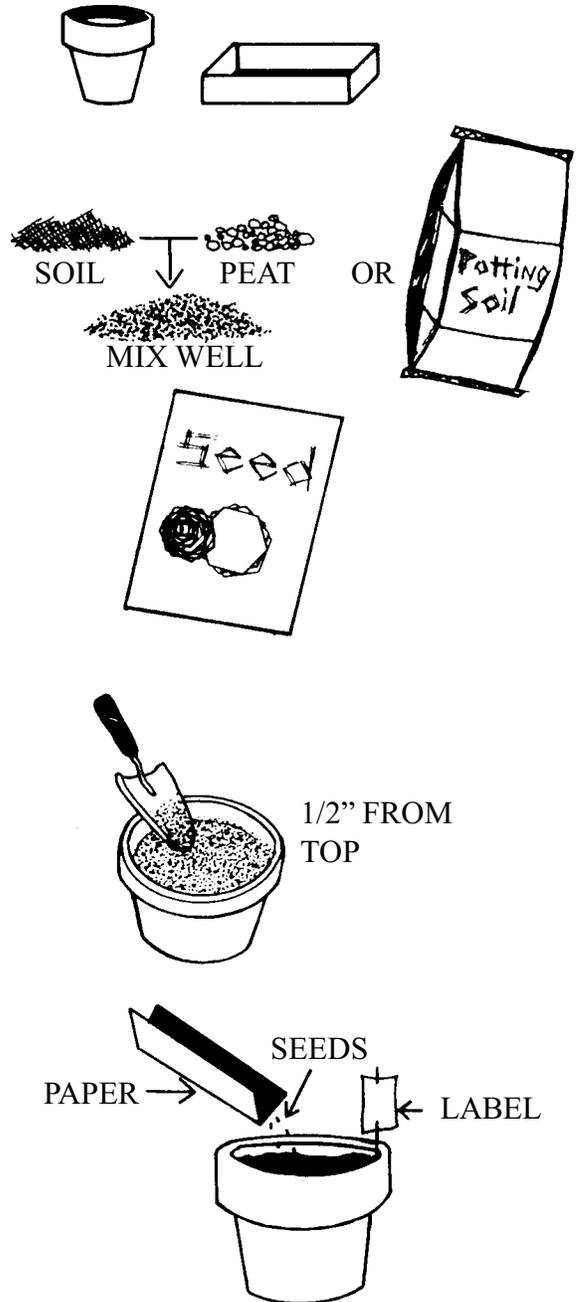
**Soil Mix** - You can mix your own soil or buy a mix from the store.

**Seeds** - Use seed like beans, peas, corn, or marigolds the first time. They are large enough to handle and germinate easily.

**Planting** - Place soil in the container. (Leave about 1/4" to 1/2" of space at the top.) Tamp the soil to make it firm and level. Make rows 1 1/2" apart and 1 1/2" deep.

(If you are using small containers, you can plant a few seeds without rows.)

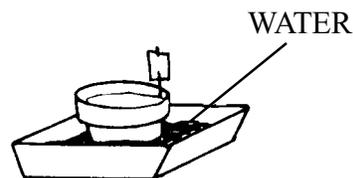
**Placing** - Place seeds 1/2" to 1" apart, depending on size. Cover seeds with soil and tamp lightly.



**Watering** - water the container but be careful not to wash seeds out of the rows.

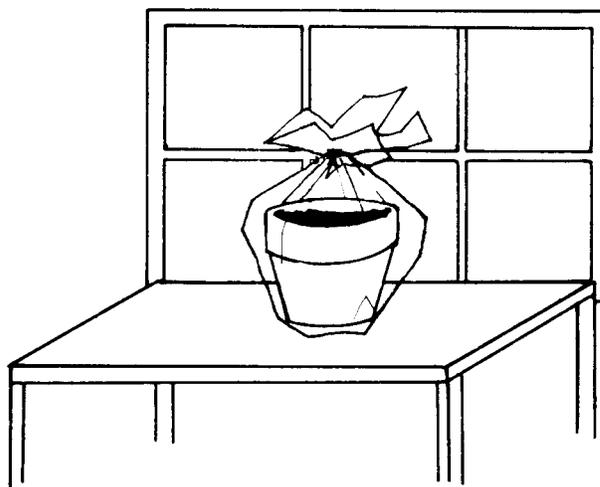
OR

You can place the container in a pan of water and allow water to soak up from the bottom.

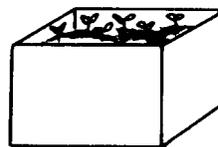


**Lighting** - place the container where it gets light and you can watch it.

You may wish to cover it with clear plastic so you will not need to water so often. Remove the plastic bag or covering when the new plants begin to come up.



**Growing** - watch your planting for several days and notice when the plants begin to come up and their growth from day to day.



**Growing** - When new plants come up they are called seedlings. The first leaves on plants like beans peas and marigolds are called seed leaves. The next leaves that grow are called true leaves.

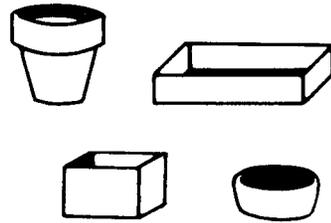


## 12. Lets Transplant

When seedlings are established in the seed flat and the first true leaves are formed, they should be transplanted into larger, individual containers so they will have more room to grow. TRANSPLANT means to move the plants from one container to another or to the soil outside. The transplanting discussed here is moving seedlings from the seed flat to a larger container so they can grow into large, healthy plants. They may be transplanted again later into an outdoor flower bed, field, or larger pot. Bean, corn and pea seedlings, which you may have grown in the last exercise, do not transplant well. Tomato and marigold are good plants to begin transplanting with.

### **HERE IS HOW:**

**Pots-** The pots you use depends upon how long you plan to leave the seedling in the pot and what you have available. Peat-pots, plastic pots, and clay pots are often used. Milk cartons from the school lunch room work fine when washed and the top cut out.



Be sure to punch holes in the bottom for drainage.

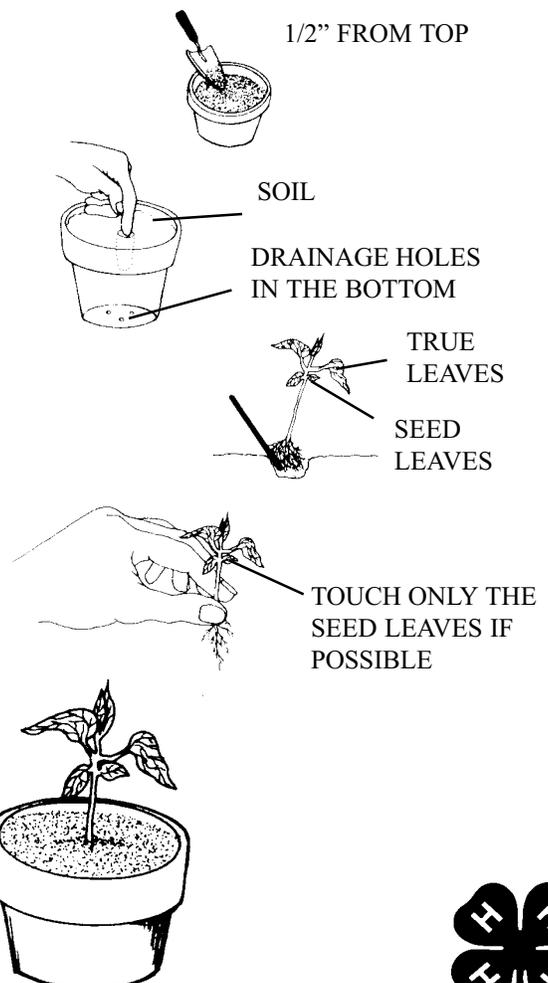
**Soil** - Fill the pots with soil, but do not pack it. You may use the same kind of soil you started the seeds in.

**Planting** - Make a hole in the center of the pot with your finger or a stick.

Loosen the soil around the seedlings with a stick, pencil, or knife.

Pull a seedling out gently and place it in the hole you made in the new pot.

Press the soil firmly around the plant with the thumb and index finger. The seedling should be planted just a little deeper than it was in the seed flat. (Be careful that you do not damage the stalk by squeezing.)

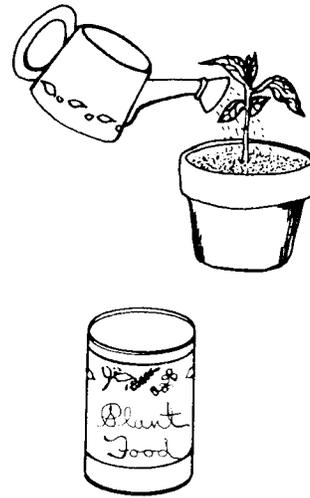


**Watering** - Water the new transplants thoroughly and allow any excess water to drain.

Place the plants in plenty of light. If they are placed in a window, you may need to move them every few days so they all get light.

**Fertilizing** - One week after transplanting, you should begin to fertilize. A garden or variety store will have a good water-soluble fertilizer. Follow the directions on the label.

When the weather is warm enough, the seedling can be planted into larger pots or in flower pots outside.



### 13. Plants For Food

Plants provide us with much of the food we eat. Different parts of plants are eaten for food.

We eat the SEED of some plants	PECAN BEANS	PEAS CORN
only the flesh COVERING of the SEED on some	PEACHES PEARS	APPLES GRAPES
the LEAF of others	LETTUCE SPINACH	CABBAGE
and on others we eat ROOTS	RADISHES BEETS SWEET POTATOES	TURNIPS CARROTS
and we even eat the FLOWER on	BROCCOLI	CAULIFLOWER
or the STEM of	ASPARAGUS	
also some foods are prepared from the JUICES of the FRUIT or other parts of the plant	JELLY	DRINKS
many products made from field crop plants are used for food	FLOUR FROM WHEAT MEAL FROM CORN OIL FROM PEANUTS AND COTTONSEED	
many plants and plant part are made into drugs, medicines, and seasonings	SAGE SPEARMINT DIGITALIS	DILL BASIL PEPPER

Remember: there are some plants and plant parts that are poisonous and should not be used for food.

# Man Must Have Plants To Live !!

## An Activity

Keep a record of the foods you eat for a week and see what parts of different plants you eat:

Here are some tips:

\*Flour is made from wheat seed.

\*Black pepper is ground seed.

\*Potatoes are underground stems.

\*Read the label on food containers.

\*Check mom's spice shelf - some are made from leaves, some from stems etc. ,

Name of food	Part of plant it comes from	Name of food	Part of plant it comes from

### FOOD PLANT SCRAMBLE

There are names of food plants hidden in this scramble. Find these names and circle them.

Some are straight across and some are straight down. The circles may overlap.

Can you find names of all these plants?

POTATO

TOMATO

APPLE

BEAN

PEAS

OATS

WHEAT

CORN

P	O	T	A	T	O	Z	K	L	Y
X	C	V	D	O	A	P	L	E	C
A	A	I	X	N	T	Y	T	S	Z
T	Y	P	E	A	S	S	N	G	D
Y	B	Z	A	Y	X	C	R	N	D
L	B	W	H	E	A	T	Y	O	X
Z	N	Y	L	C	S	T	A	B	A
T	O	M	A	T	O	X	T	I	L
O	Z	L	A	Y	T	R	Q	T	U
B	E	A	N	M	X	E	O	N	Z



## 14. Let's Grow Vegetables

You can grow vegetable plants even if you do not have a place to plant a garden. GROWING VEGETABLES IN CONTAINERS can be fun and provide you with vegetables at the same time, AND you can grow them in the front yard, flower pots, and anywhere they can get sun most of the day.

### Here's How!

#### \*\*Decide What Plants To Grow

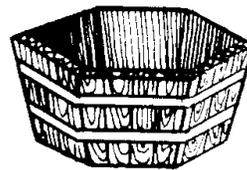
Tomatoes, onions, lettuce, pepper, and radishes are good plants for you to begin with. Tomato varieties with small vines are easier to handle. Patio and Tiny Tim are good varieties for containers.

#### \*\* Select A Container

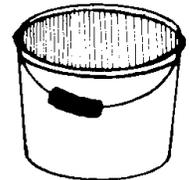
Your container can be buckets, boxes, baskets, pots, or anything that will hold soil and has drainage holes in the bottom.

The container should be large enough to hold the plants when they are grown. Size and number of containers depends on how much space you have and how many plants you plan to grow.

Radishes and onions can be grown in six-inch flower pots--while tomatoes and peppers will do best in at least a two gallon container. Be sure to drill four or more 1/4 inch holes in the containers to let out excess water.



WOODEN POT



BUCKET



BOX

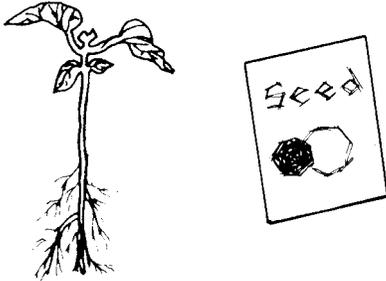
#### \*\* Get A Growing Mix

For growing vegetables in containers, you should buy a mix from the local greenhouse or garden center. This mix will contain such things as peat moss and vermiculite. This type of mix usually works better than garden soil because it doesn't pack and is free from weed seed and diseases.



## \*\* Plant And Seed

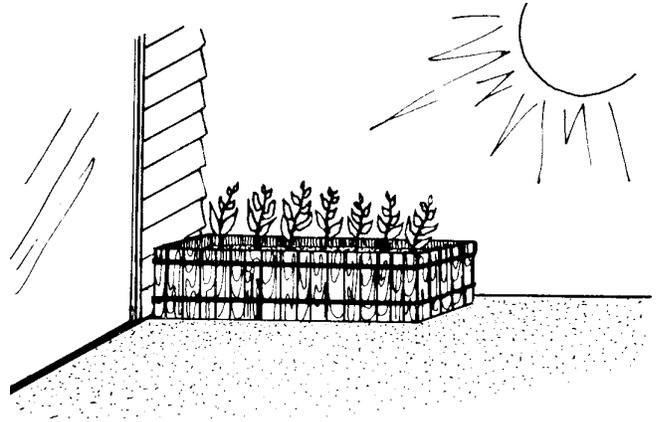
You may want to use some of the plants you have grown yourself. Tomato, pepper, and onion plants are usually transplanted into the containers. Radish and lettuce seed should be planted. Follow the directions given for planting a seed flat, but do not plant too thick.



BE SURE to check with your parents about planting dates for vegetables.

## \*\* Set Containers In light

Vegetables need as much sun as possible. However, if they are to be grown in part shade, leafy vegetables such as lettuce, cabbage, and mustard can stand more shade than other vegetables.



## \*\* Fertilize

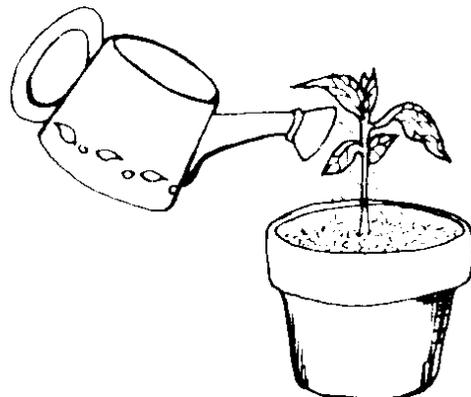


Apply one-half teaspoon of 10-20-10 or 12-24-12 fertilizer per square foot of soil three weeks after transplanting or after seedlings have three leaves. Apply this same amount of fertilizer each three weeks. Mix the fertilizer into the top one-half inch of soil and water thoroughly. (Be careful not to damage roots.)

You may also use a water soluble fertilizer. This is one that will dissolve completely in water. Check with your garden center or plant store to see what is available.

## Water

Water needs are different for different types of soil. However here are some watering tips. When the soil becomes dry to a depth of one-fourth to one-half inch, apply enough water to completely soak the root area-try to water without getting the leaves wet. Water in the morning rather than at night when possible because this helps keep disease from getting started.



Here is a list of information that will help you, your parents, and 4-H leaders learn more about growing vegetables:

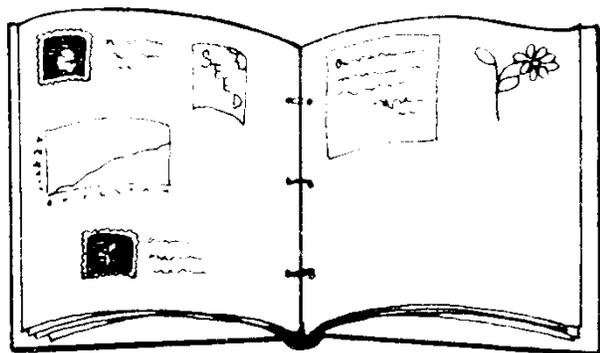
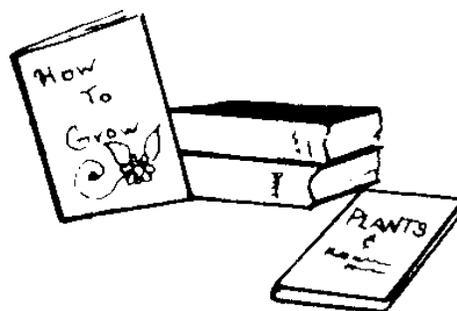
1. Minigardens For Vegetables: U. S. D. A. Home and Garden Bulletin No. 163
2. Oklahoma Garden Planning Guide: Fact Sheet No. 6004
3. Vegetable Varieties For Oklahoma: Fact Sheet No. 6011
4. Growing Vegetables In The Home Garden: U. S. D. A. Home and Garden Bulletin No. 202
5. Fall Gardening: Fact Sheet No. 6009
6. Mulching Vegetable Garden Soils: Fact Sheet No. 6005

This and other information about vegetable gardening is available at your county extension office.

## OTHER ACTIVITIES

### **\*\* Start Your Own Library !!!**

Begin to collect books, bulletins, fact sheets, and other information about plants and things you can do with them. Have a special place in your room to keep them along with your 4-H horticulture books.



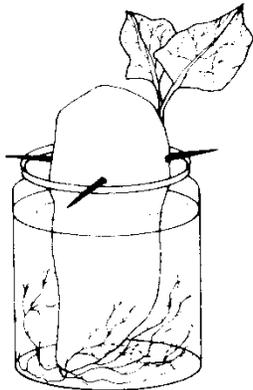
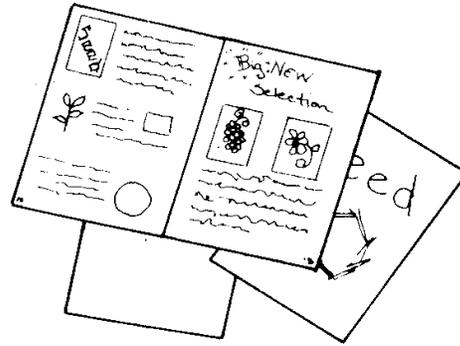
### **\*\* Begin A Scrapbook**

Take pictures of your plants and have someone take pictures of you working with plants. Keep these along with records of what you do in a scrapbook. If you do not have a scrapbook, a shoe box or dresser drawer can serve as a storage place. This material can be used in your record book at the end of the year.

## **\*\* Order Seed Catalogs**

(Ask your mom or 4-H Leader to help you get addresses.)

Learn what different vegetables look like. Cut out pictures of leafy vegetables, root crop vegetables, etc., and paste them on a sheet of typing paper. Ask your teacher to let you make a book showing pictures of plants you study about in Health or Science.



## **\*\* Make A Sweet Potato Planter**

Place a sweet potato into a jar of water. Leave about one-half of the potato sticking out. Record the date you started-when the first roots began to grow-and when the first shoots start to grow. Take it to school for decoration in your room.

## **\*\* Collect Plant Seeds**

Put each kind of seed in a vial or pill bottle and name it. You may also glue or tape them on a sheet of paper. Collect tree seeds-vegetable seeds-grass seeds-fruit seeds-and nut tree seeds.

Write a friend or relative who lives in another part of the country and ask them to send seeds of plants that do not grow here. HOW MANY CAN YOU COLLECT THIS YEAR?



## **\*\* Invite A Friend**

Do you have friends who are not in 4-H or who are not enrolled in horticulture? Ask them to work with you on your project. It will be a lot of fun, and you might help them get interested in 4-H and horticulture. You will be a leader.

## **\*\* Tell Others**

Prepare and give a short talk about something you are doing in 4-H horticulture. Ask permission to give it to your class at school. You can also give a talk or demonstration at the county Talks and Demonstration Contest. In a demonstration, you can show how you seed a flat-transplant a plant or something else you have done.



**\*\* Learn More**

Check the encyclopedia for more information about the things you are most interested in horticulture.

Look under these words:

PLANTS

FOOD PRODUCTION

TREES

WHEAT

FLOWERS

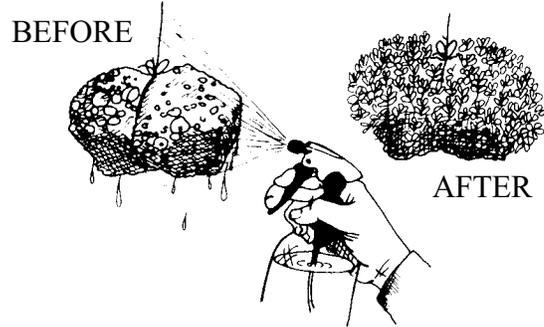
AGRONOMY

FIELD CROPS

Cut a pineapple or carrot 1 1/2" from the top and place in a shallow dish of water or in a pot of loose, damp soil. Keep moist and place in a sunny spot.



Sprinkle seeds of annual rye, clover, or mustard seeds on a wet sponge. Tie on a string and hang it in a sunny window. Spray sponge to keep wet. What happens??



**FIND THE WORDS**

PHILODENDRON is a plant name that is known to most people. Using the letters in the word philodendron, make as many new words as you can.

EXAMPLE: Ron, noon....

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# Let's Learn About Plant Diseases

## Why Diseases are Important

Plants, like people and animals become sick and die. Plant diseases have been a problem for men ever since the beginning of time. Plant diseases can be traced back to the most ancient written records of crop cultivation. In the year 994 AD, 40,000 people died in Europe from eating grain that was diseased. In more recent history a disease of potatoes caused many Irishmen to come to the United States. The disease, called potato late blight, killed all the potatoes and starved many Irishmen out of Ireland in the mid-1900's.

In the early 1900's there were many beautiful chestnut trees in the eastern part of the United States. A fungus disease called chestnut blight caused most chestnut trees to become sick and die. As a result of this disease, chestnut trees have just about disappeared from the United States. Now it is no longer possible for most children to roast chestnuts and know how good they are to eat.

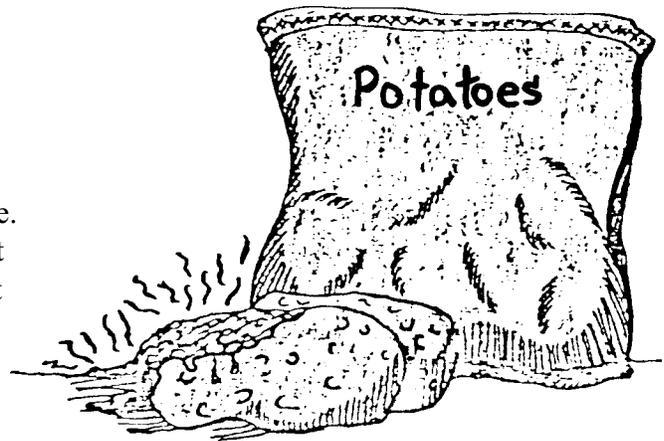
Today the world is still affected by plant diseases. Only a few years ago a disease called late blight of corn destroyed thousands of acres of corn in the United States. Plant diseases are even more threatening today than in the past because farmers grow larger fields of one crop and there is a greater chance for diseases to get started.

Every year plant diseases continue to destroy our crops, garden vegetables, flowers, trees, and shrubs which beautify our homes. It is a known fact that plant diseases on the average, cause one plant out of every 10 (10%) to become sick and not produce as much as it should. You can help protect plants and crops from diseases by learning how plants become sick and how diseases can be prevented and controlled.

## What Do The Terms "Plant Pathologist" and "Plant Pathology" Mean ?

Everybody is familiar with medical doctors and know they are trained to identify diseases of man. There are also people who are plant doctors, and they study plant diseases and how to prevent them. Plant doctors are called plant pathologists. You may want to become a plant pathologist when you grow up, because plant diseases will continue to attack our crops, and we must control them in order to provide people with food, clothing and other things that come from plants and plant products.

A person, such as plant pathologist, who helps keep the plants healthy will be helping to feed and clothe the people of the world.



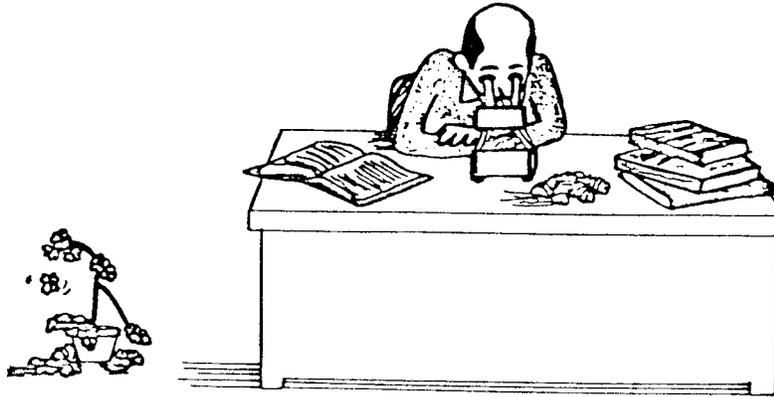
Rotting and smelling potatoes infected by Late Blight potato disease



Let us start this discussion by asking . . .

“What is plant pathology and what is a plant pathologist?”

Plant pathology means “the study of diseases of plants.” A plant pathologist is a scientist who studies the nature, cause and prevention of plant diseases.



### **What is a Plant Disease?**

A plant disease is any harmful condition that makes a plant different from a normal plant in appearance or function. If a plant is diseased (sick) then something must be causing the problem.

In Unit II you will learn how plants tell people they have a disease.

### **AN ACTIVITY**

Draw a line from each word to the correct meaning across the page.

Plant Pathology

Any harmful condition that makes a plant different from a normal plant.

Plant Pathologist

The study of diseases of plants.

Plant Disease

A scientist who studies the nature, cause and prevention of plant diseases.

The Irish famine was caused by what disease on what vegetable?

The disease was \_\_\_\_\_.

The vegetable was \_\_\_\_\_.