Leader's Guide

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4-H Plant Science Unit 2

VEGETABLE GARDENING

PENNSTATE

College of Agricultural Sciences
Cooperative Extension

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Welcome to *Vegetable Gardening,* the second unit of the Plant Science series. This is an Introductory level (11-12 years of age) unit to familiarize youth with some of the easily-grown and more common vegetables found in vegetable gardens.

Vegetable Gardening is a six lesson project book which supports the 4-H program. 4-H is an educational program designed to help develop attitudes, values, and skills that will make young people become productive members of society.

The 4-H emblem represents the head, heart, hands, and health which correspond with educational, moral, work, and health ethics. One purpose of 4-H is to provide "hands on" experiences and opportunities to youth for developing their highest potentials in these areas. Specific goals supported by this project are:

1. Developing youth's concern for the society and larger world.

2. Increasing youth's understanding of science and appreciation for nature.

3. Developing good consumer skills.

4. Developing life skills:
• creative use of leisure time • marketable attitudes and skills leading to a career
• desirable interpersonal relationships • responsible citizenship
• leadership • communication skills
• responsibility

Understanding Youth Needs

In order to fulfill the objectives of the 4-H program, it is important to have an understanding of youths' common needs. These basic needs must be met in order for them to progress to adulthood in a healthy manner. These needs include:

• To experience a satisfactory self-concept
• To experience success in achievement
• To become independent individuals
• To experience adventure
• To develop and accept one's sex role
• To experience acceptance by peers and adults

Although children develop individual personalities, some characteristics are commonly shared by youth 10-12 years old. Leaders should strive to meet these needs in these suggested ways.

Characteristics of Youth:	**Implications for Leaders:**
• Look to family for approval, but want to be independent of parents.	• Play up successes, minimizing failure.
• Limited ability to make decisions, need freedom to develop own ideas, interests, attitudes	• Encourage less dependence on leaders' decision-making. Avoid dictating direction, yet still provide reassurance and support.
• Need to develop sense of worth and security within own group. High interest in competition and single sex activities.	• Allow for homogeneous groupings, provide outlets for competitive drives.
• Comparison with others difficult to internalize	• Compare work with previous efforts.
• Short interest span; interest in varied active experiences; curiosity in concrete learning.	• Provide educational activities with tangible results. Give short, simple directions, repeat often.

To summarize the key concepts outlined above, when working with youth, remember:
• It is important to continue to play up successes, even small ones, and minimize failures.
• Children like to talk to interesting people who bring things they can SEE and HANDLE.
• This is the age during which children like to explore many areas until skills are found that catch their interest and challenge their ability.
• Children prefer to compare their work with their own previous efforts, not their peers'.
• Evaluation by the individual is desirable. Adults can help determine if improvement is made.
• Adults should be ready to shift the child's life into his/her own hands as soon as they know their ability and willingness to grasp responsibilities.

4-H Educational Experiences

As a leader you can increase and maintain the interest that is raised by allowing members to help plan and conduct community events. 4-H members gain leadership and group skills by participating in making and carrying out plans. Some ideas you can use are:

Family Involvement in a kick-off party for present and prospective members and their parents generates enthusiasm for the new year. Parents' events might include an evening program presented by members, a potluck meeting with a short 4-H program, or a summer family picnic.

Tours and Field Trips are educational as well as recreational if planned ahead of time.

Demonstrations at local meetings are good preparation for a similar county-wide event. Have youth give demonstrations to community organizations including nursery and garden clubs, parent-teacher associations and service groups, and to nursing and retirement homes.

Decision-Making and Judging begin by making choices between two or more things and being able to explain the reasons for these choices. Making decisions based on standards of quality is a very useful skill. You can teach these standards by providing opportunities for youth to choose and compare products and plant materials and having them discuss, compare, and contrast the strong and weak points of each. Contact your county extension office for publications such as the 4-H Manuals for Flower and Vegetable Judging.

Discussions and Problem-Solving are an effective way for youth to teach themselves different subjects, to gather experience in presenting their views and opinions to a group, and to learn the art of active listening. As a leader, you can stimulate thinking and problem-solving abilities through many of the hands-on activities. You can also generate discussions by planning thoughtful and thought-provoking questions to youth.

Exhibits used at local events for parents, friends, and community members are an excellent way to recognize these youth and to promote the 4-H program you conduct.

Community Service is an integral part of 4-H. Sharing with others allows youth to practice leadership and communication skills, develop commitment to the community and its needs, and also encourages family involvement. This sharing spirit will contribute to youth's sense of membership in the community. Your telephone directory's guide to human services can be consulted for listings of agencies and centers that might appreciate your group's contribution. Such activities might include giving presentations to a health-care facility, senior citizen's group, making an audio tape for the blind, or having youth identify activities to become involved in.

How to Use This Guide

This manual provides additional information to complement the member's guide. You are encouraged to *expand, rearrange, and provide innovative lessons* to meet the needs of your group, whether it is a community or project club or school enrichment program.

The leader's guide is divided into sections that will help you organize a meeting or lesson on each of the six topics in the member's guide. Each topic in this guide has five major parts:

I. Topic Introduction
II. Purpose and objectives
III. Teaching aids
IV. Procedures
V. Looking ahead

More information regarding project resources, materials, and 4-H events may be found in the *Meet The Plants* leader's guide.

Vegetable Gardening, the second unit of the Meet the Plants series, incorporates the use of the Scientific Method into the experiments these members should complete. The Scientific Method should be explained each time they conduct the Experiments in Lessons 3, 4 and 5. After one or two experiments have been completed, these members may be able to repeat the steps of the Scientific Method without you explaining it again. Upon completion of each experiment, have members match steps of the experiment to the steps in the Scientific Method.

Each step of the Scientific Method is shown below accompanied by a brief explanation.

1. **Formulate an hypothesis**-—the process of putting forth an idea or proposal about something that interests the researcher or the researcher believes to be factual. An example is "A seed will sprout more quickly at 85° than at 65°F."
2. **Design an experiment**—constructing a real-life simulation that will prove or disprove the hypothesis. The researcher designs an experiment which will test the hypothesis. This step involves the use of deductive reasoning—using general facts or knowledge to arrive at specific instances or facts. In the case of this hypothesis, the researcher knows plants generally grow more quickly at 85° than at 65°F and, therefore, seeds should also sprout more quickly. The researcher sprouts two sets (replications) of five bean seeds in paper towels kept constantly moist at the two temperatures (85° and 65°F) which are kept constant.
3. **Collect data**—scientific information is gathered to support or deny the hypothesis the researcher formulated. Recording periodic observations from the experiment provide the evidence and facts.
4. **Draw conclusions**—based upon the evidence and facts which have been gathered, the researcher concludes whether their hypothesis has been proven or disproven.

Recommended Resources

The following books are highly recommended as supplementary materials which you may find helpful for use in this project as well as other vegetable gardening projects:

Square Foot Gardening
Mel Bartholomew
C. 1981; Rodale Press, Emmaus, PA

Taylor's Guide to Vegetables and Herbs
Norman Taylor
C. 1987; Houghton Mifflin Co, Boston, MA.

The Ortho Gardening Series—available at most garden centers, book and department stores

Lesson 1. GROUPS OF VEGETABLE PLANTS

I. Topic introduction

Vegetable plants can be grouped in three different ways. Groupings help determine the most effective growing methods for each plant. One grouping is according to a plant's life cycle. For example, annuals are plants that grow, produce seed, and die in one growing season. Many of the more commonly grown vegetables are annuals. Biennials take two years to complete their life cycle. The first year is spent growing vegetatively—growing leaves, stems, and roots—but no flowers. Flowering occurs during the second growing season. Carrots, red beets, cabbage, and onions are biennials. Perennial plants are similar to annuals because they grow, produce seeds in the same growing season, but don't completely die when winter arrives. They go dormant over the winter and then start growing again in the spring. They can live for years unless they are killed by a disease or environmental problem. Rhubarb and asparagus are examples of perennials.

Another way of grouping plants is by the climatic conditions they prefer. Some plants grow best in cool weather, 50°–70° days and 40°–55° nights. When the temperature is warmer than this, their growth rate slows down. Some cool season vegetables, like lettuce or spinach, produce flowers or "bolt" when the weather gets above 80°. When bolting occurs, the stem usually elongates and the leaves can turn bitter-tasting. Other cool season vegetables are peas, broccoli, turnips, beets, cabbage, radishes, and carrots.

Warm season plants grow best in warm weather, 70°–90° days and 60°–70° nights. They are not hardy because a frost will kill them. Cool temperatures will slow their growth rate down or even stunt them. As a result, they may never completely recover and produce the quantity expected. Warm weather vegetables include tomatoes, peppers, beans, corn, eggplant, and the vining crops such as cucumbers, squash, and melons.

A third way to group plants is by which part of the plant is commonly eaten. Lettuce is called a leafy vegetable because the leaves are used for food. Carrots are a root crop since we eat the root. Although we really eat the petiole of the celery plant, we call the edible portion the stem of the plant. The head of broccoli we eat is actually an unopened flower head. If you wait until the flower opens, the head becomes inedible.

By knowing which group a vegetable belongs to, the gardener can provide the right growing conditions to produce the healthiest and largest crop of vegetables possible. If the gardener knows which vegetables are cool season and which are warm season plants, he or she will know which crops must be protected from the frost. The gardener would harvest the head of broccoli while the flowers are still closed tight. If they know that a carrot is a biennial, they can harvest carrots from the garden during the winter.

Activity 2 requires the 4-H members to eat various kinds of vegetables. Fresh vegetables are a healthy way of bringing aspects of nutrition into children's thoughts. If they are involved with gardening, the more likely they are to enjoy eating what they have grown. The earlier they develop a willingness to taste and eat fresh vegetables, the healthier their eating habits are likely to remain throughout their adult life.

II. Purpose and Objectives

The youth will be able to:

- Explain differences in the three major groups of vegetable plants and why they are important.
- Taste and identify at least ten different vegetables and their edible parts.

III. Teaching Aids

Materials each member will need:

ACTIVITY 1. Vegetable Concentration

See Member's Guide

ACTIVITY 2. What Part Am I? Vegetable Tasting Bee
See Member's Guide

ACTIVITY 3. Picking Favorites!
See Member's Guide

IV. Procedures

ACTIVITY 1. Vegetable Concentration
This activity is designed to introduce members to the identification of vegetables, their names, and the plant groupings discussed in Lesson 1. Several different versions of the Concentration game can be played. For example, one version can be to identify the vegetable by common name only. As the members become more knowledgeable, you can have them identify the edible parts and temperature requirements of the vegetables featured on each pair of cards.

A team, rather than an individual, game can also be played. One member correctly states the part of the plant eaten. If a member gives an incorrect answer, the next person on the opposite team may try and answer the question. The same card keeps being shown back and forth between the two teams until someone identifies the vegetable correctly. After all of the cards have been shown, the team with the most points win.

ACTIVITY 2. What Part Am I? Vegetable Tasting Bee
Cut the fresh vegetables into bite-size pieces or try cutting vegetables into interesting shapes. If the members are old enough to handle a knife, they may want to cut some of the vegetables into the interesting shapes themselves. Zucchini can be cut into half moons. Cauliflower and broccoli can be sliced into little "trees." Depending on the season and time of year, there will be more varieties of vegetables available than at other times.

Members should be encouraged to taste as many new and different vegetables as possible. You might consider having table seasonings, sauces, or dips to accompany the vegetables as an enticement for the members to taste a new vegetable.

ACTIVITY 3. Picking Favorites! Which Vegetables Will I Grow?
Students learn better and remember longer if they use as many of their senses as possible when they are learning. Along with cutting out pictures showing vegetables, tasting an assortment of fresh vegetables will help members decide on which ones they would like to grow. You might also introduce nutrition to the members.

Based upon the identification and tasting activities they will have completed, they should be capable of selecting some examples of vegetables they would like to grow. They should have also become familiar enough with a garden catalog to select particular varieties of vegetables. If they carefully read and follow the directions in the front of most mail-order catalogs, they will be able to make the decisions required to fill in the *FAVORITE VEGETABLES LIST* This activity could even be done at home if they have personal copies of garden catalogs or they may want to visit a local seed dealer, garden center, or nursery.

Optional Teaching Activities
Super Salad
What you will need:
- Food processor or sharp knife
- Lettuce
- Forks
- Salt and pepper
- Bowl to hold entire salad
- Bowls for toppings
- Selection of vegetables to use as toppings
- Ingredients and container for vinaigrette dressing: (1 part vinegar) (3 parts oil)

Members can prepare the lettuce by washing and tearing it into bite-size pieces. Have them place the salad and toppings in bowls and make the vinaigrette by combining all the ingredients and shaking the container well. The salad can be served from a single bowl or salad-bar style so everyone can create their own salad.

V. Looking Ahead (to Lesson 2. PLANNING AND DESIGNING YOUR VEGETABLE GARDEN)

It is important the members have their own seed catalogs or for you to provide them for their use in looking up the vegetables they want to grow in their gardens. In this next lesson they will be investing their time and energy deciding which varieties to select while completing the calendar and garden plans. Be sure to have enough sources of information available for the members to use. You might even consider a fieldtrip to a nursery or garden center to have members look for their vegetable varieties on a seed display rack. If so, be sure to plan ahead and make contact with the appropriate individuals in time for everyone to prepare.

Lesson 2. PLANNING AND DESIGNING YOUR VEGETABLE GARDEN

I. Topic Introduction

The old rhyme about how to plant a vegetable garden—one for the black bird, one for the mouse, one for the rabbit, and one for the house—should not describe the garden these 4-Hers are going to be planting. The best advice you can give a first time gardener is to think small and start small. A 4-foot by 4-foot area, or 16 square feet, is plenty of garden space for most youngsters for their first vegetable gardening. Almost every youngster should have an area this size, whether it is in containers on a porch or in their backyard.

An important consideration is the amount of maintenance time these youngsters will be putting into their vegetable garden. A conventional, single row garden needs approximately 2 hours of maintenance per week for every 100 square feet. Gardening should be an exciting, positive, and fun learning activity, not a drudgery and a chore. With all of their other committments and activities, an additional 30 minutes a week spent on garden maintenance may be all these 4-Hers can and want to give.

Lessons 3, 4, and 5 deal with the environmental factors that all plants, especially vegetables, require for growth. With one exception—sunlight—all of these environmental factors can usually be adapted or changed to meet the requirements of the particular vegetable plants these youngsters will be growing.

The *VEGETABLE PLANTING CHART* shown on page 8 shows some of the more easily-grown vegetables for beginners to plant. Although individual interests will vary, you should try to encourage them to select from these vegetables. The success rate beginning gardeners should have with these vegetables will far outweigh the risk of failure with more-demanding crops. The skill and management techniques they learn from this project will increase their ability with more-difficult-to-grow crops later in their 4-H program.

II. Purpose and Objectives

The youth will be able to:

- Collect reliable information to make decisions regarding vegetable varieties.
- Prepare a garden plan using appropriate techniques.
- Prepare a garden calendar for all of their vegetables.

III. Teaching aids

ACTIVITY 1. Planning a Home For Your Vegetables

See Member's Guide page 6 for a list of required materials

ACTIVITY 2. Preparing a Garden Plan

See Member's Guide page 8 for a list of required materials

ACTIVITY 3. My Calendar Plan

See Member's Guide page 10 for a list of required materials

IV. Procedures

ACTIVITY 1. Planning a Home For Your Vegetables

Members should select no more than ten different vegetables to grow from the list on page 6. There are enough varieties within each of the types of vegetable to allow each member or small group of individuals to plan a unique gardening experience. This is an excellent opportunity for you to guide youngsters through both problem solving and discussion activities centered around which varieties to choose. You can also use decision making to determine what varieties of vegetables will be grown by individual members. The information asked for in this sheet should be completed by the member before they move on to Activity 2.

The following information may be presented to the 4-Hers at the time they are completing the chart of the vegetables they are planning to grow.

Root Crops, Tubers and Bulbs—Root crops are grown for the usable root, bulb, or tubers. The foliage color, size, and shape are key features to look for when separating the different kinds as well as the size, shape, and color of the underground portion.

Beets have large, green to dark green leaves often with red veins. The seeds are brown and corky, about 3/16 inch in diameter. Beets are related to swiss chard and sugar beets. They originated in Europe, North Africa, and the near East. The Germans first used red beets in the 1500's. Early settlers brought these to America.

Swiss chard is a type of beet developed for its large crisp leaves and fleshy leafstalks rather than its roots. Although it is a cool season crop and can stand light frosts, it will withstand warm summer temperatures also. It was first reported being grown in the Mediterranean region and the Canary Islands off the coast of Africa. The seeds of swiss chard are medium in size and there are about 1,200 seeds per ounce

Onions are the only vegetable in this group with narrow, green blades extending out of white sheaths. Bulbs have either a dry white-, yellow-, or red-colored skin surrounding the many fleshy scaled leaves. Onion seeds are black, smooth, and about 1/16 inch across. Our common onion originated in middle Asia. Onions were cultivated as food from the earliest period of recorded history. They were eaten by the laborers constructing the giant pyramids of Egypt and by Roman soldiers. The Spanish introduced the onion to the West Indies and from there it soon spread to all parts of the Americas.

Radishes have leaves similar to beets except that they are smaller and entirely green. The most common radish is very round or only slightly oval with bright red skin. Some radishes are elongated, usually with white skin. Radish seeds are brownish, rounded and about 1/8 inch long. China is the country of origin for the radish. This vegetable was a common food of the Egyptians, ancient Romans, and Greeks. The radish was brought here by Columbus.

Salad Crops—We eat the leaves or the leaf petioles of these plants.

Lettuce leaves surround the core or stem and overlap each other to form a head. The crisp leaves can be green or red, smooth or crinkled. Seeds are black or white, about 1/8 inch long. Our most popular salad plant originated in the near East. It was popular with the Persian kings and Romans. Seeds were brought to the New World by Columbus. Lettuce was no doubt among the first garden seeds sown in every European colony in the country.

Spinach leaves are thick, dark green, smooth or crinkled. Spinach does not form heads but grows as a low spreading plant. Seeds are about 1/8 inch long. Spinach comes from southwest Asia. The Persians once used it for medicine. Explorers carried it to cool climates throughout the world where it was used as a potherb. As early as 1500, spinach was being grown in England. It was also commonly grown in American gardens during the colonial days. Spinach was once a special dish in Europe. Spinach has a lot of vitamins in it, especially vitamins A and C.

Cole Crops—The plants in this group all belong to the mustard family. They usually have thick, large leaves, and the flowers have 4-petals with small black seeds.

Broccoli—We eat the flower bud clusters and their stems while the buds are still tiny and dark green. The plant looks very much like cauliflower. Both have a central stalk topped by the flower cluster (about 6 inches across), and surrounded by the large leaves. Broccoli leaves are usually more deeply cut than cauliflower leaves. Small bud clusters are produced on side-shoots. We eat the flower and the stalk. Broccoli was originally from countries on the Mediterranean Sea such as Greece, Italy, and Turkey. The Romans grew it but it wasn't until the early 1700's that the English and the Americans started growing it in their gardens. Broccoli is in the cabbage family which includes cauliflower and brussels sprouts.

Cabbage —Plants form large, rounded heads made up of overlapping layers of leaves. The leaves may be smooth or crinkled, green or dark red. The stem is short and hidden within the mass of leaves. The loose-headed cabbage originated in the Mediterranean. The hard-headed forms were developed in the cooler parts of Europe, Germany, and Denmark. Jacques Cartier, an early French explorer,

introduced cabbages to North America in 1541 when he planted some in Canada. The Indians adapted it for their own use, as did the early colonists.

Peas and Beans—We eat the fruit and/or seeds of these plants. The fruits are pods, which are long and narrow, round or oval in cross-section, and contain the seeds.

Beans (Snap)—We eat the entire pod which are 3-7 inches long, narrow, and fleshy. Seeds are oval and not flat. The plants are low and bushy, only 1 to 1-1/2 feet high. There are 3 large leaflets to each leaf. Beans were grown by Indians in North and South America long before European settlers arrived. Early explorers found Indians using beans as a staple in their diets with corn. Christopher Columbus discovered bean plants upon his arrival. Children in the Massachusetts Colony ate so many beans they adapted an old English verse which referred to "Pease Porridge"—"Bean porridge hot, bean porridge cold, Bean porridge in the pot, nine days old."

Peas—We usually eat the seeds but with some varieties the pods are also eaten. Snap pea pods are usually shorter than other pea pods. Seeds are round and smooth. The dried seeds which are planted are usually wrinkled. Plants are vines and have tendrils for climbing. Originally from middle Asia and the Near East, peas were first grown for their dry seeds. After the 16th century, use of green peas was recorded in France. The edible pod was also known then. Columbus planted peas in West Indies. The seeds spread and were introduced into America by the first colonists but they were commonly used as "split peas" until the 1700's.

Solanaceous Fruits—These plants belong to the botanical family Solanaceae (so-lan-ace-sea). We eat their fruits and tell them apart by leaves, plant form, and fruit.

Pepper fruits are green, yellow, orange, purple, or red when mature. They can be large or small, squarish, round or thin and either very mild or pungent (Hot!). The plant is bushy with smooth stems and smooth, ovate leaves. Peppers are native to Central and South America. Columbus found peppers growing in the New World and took them back to Europe. There are different kinds of peppers: some hot and some sweet. The hot ones are spicy and cause your mouth to burn. Mexican food has a lot of hot peppers in it. Sweet peppers are not hot.

Tomatoes are usually round, but can be oval or pear-shaped. When ripe, they are usually red, but can be orange, yellow, white, or striped. They vary from 1 to 6 inches in diameter. The plants are large, thick-stalked vines. Leaves are compound and hairy with a distinctive odor. The tomato originated in the Andes of South America. Even though it was American in origin, it was thought to be poisonous and grown only for decoration. Tomatoes were popular in southern Europe, but Americans were afraid to try them because they feared their poison. Thomas Jefferson grew them in 1781 and tried to convince people they were harmless. It wasn't until the 1840's that tomatoes were widely used. The tomato is now our most popular home garden vegetable.

Cucurbits—These vining plants belong to the gourd family and we eat the fruits.
Cucumbers are long, with a tough green skin that is often spiny when they are small. The vine will trail or climb and has large leaves. Seeds are flattened, white, and about 1/4 inch long. India shared cucumbers with the world and Columbus brought cucumbers to the New World. They were grown by first settlers at Jamestown, Virginia, and Plymouth, Massachusetts.

Muskmelons (Cantaloupe) are rounded or oval fruits, 8 to 10 inches long. The skin is tough and thick and may be smooth or netted. The flesh is orange or green, juicy, and fragrant with seeds in the center. Seeds are pale, about 3/8 inch long. People in Asia, Egypt, and the ancient Romans and Greeks also grew and ate these melons. Muskmelons or cantaloupes were first grown in the United States commercially in 1890. The small, hard-shelled cantaloupe that was sold at that time was brought to America from the town of Cantalupo, Italy. This type of cantaloupe was different from the ones grown earlier because it had a hard shell and could be shipped across the country without being damaged.

Watermelons originally came from arid areas, such as Asia and Africa. Watermelons can be 8 inches to 2 feet long. They are oval or rounded, with pink, orange or yellow juicy flesh, and thick, hard green

skins that may be striped. The seeds are flat and black, about 1/2 inch long. Leaves are 6 to 8 inches across and are deeply lobed.

Pumpkins are usually round, but the ones used for pumpkin pies often have a crooked neck. They have hard orange skins and a hollow cavity inside filled with white, flat seeds about 1/2 inch long. Squash and pumpkins are closely related. They are natives to the Americas. The Indians were growing pumpkins for hundreds of years before the first Europeans came to America. Jack-o-lanterns were made in the British Isles and France before Christ. They were made from turnips, beets, and potatoes. When the settlers came to America, they discovered the orange pumpkins were perfect for that purpose. The colonists ate pumpkins with great regularity.

Squash come in different sizes, shapes, and colors. Zucchini look like big cucumbers; butternut squash is shaped like a big tan pear. The 'Patty pan' variety is a round, white fruit with scalloped edges. Some squash are called summer varieties because they mature quickly and have their skins. Other varieties are called winter squash because they have hard skins, can be stored in a root cellar, and are eaten during the winter. Some varieties of squash were cultivated as long ago as 6000 to 4300 B.C. Squash was a staple food of the Indian tribes all over America. European visitors to the Atlantic coast discovered summer squash there in the 1600's.

Sweet Corn—We eat the seeds or kernels of sweet corn. Actually, each kernel is a 1-seeded fruit. An ear of corn is covered with leaf-like husks, under which are the kernels growing on the cob. One or two ears grow on the 4 to 8 foot tall plants. Leaves are very long. Suckers and prop roots often form at the base of the stalk. Corn or maize, as the Indians called it, originated in the Andes mountains of Peru. Corn supported the early civilizations of the Americas. Fossils show that corn was grown in North America more than 4000 years ago. Following the discovery of America, corn spread rapidly throughout the world. Sweet corn is of more recent origin and it did not become important until the early 1800's. Until that time, most people ate young, field corn. Historically corn is one of our most important food plants.

ACTIVITY 2. Preparing a Garden Plan

There are many reasons for having members prepare a garden plan. One of the chief reasons is to have them deliberately think about what they are going to be planting, where, and how much. They will also be better able to use their garden space, their time, and effort by planning ahead. It is very similar to building a house without blueprints or taking an automobile trip somewhere you've never been before without looking at a road map.

The ideal spacing for each vegetable plant is shown under the column *Distance between plants after thinning*. If members are unable to plant a large area into rows, then these spacings can be made into fractions of feet—3 inches = 1/4 foot; 4 inches = 1/3 foot, and so on. With the exception of some of the larger plants (corn, melons, and squash), the best scale to use on the graph paper in the member's guide is 1 inch = 1 small square. The number of plants of each type that can fit into a square depends on how big the plants get when full grown and how far they spread. For example, beets, carrots, onions, and radishes would fit into a 3-inch spacing. Bush beans and spinach would be spaced every 4 inches. 6-inch spacing would be needed for Swiss chard, leaf lettuce, and parsley. Vining crops (melons and squash) would be spaced on a 12-inch distance.

ACTIVITY 3. My Calendar Plan

The main reason for having youngsters prepare a garden calendar is to have them deliberately plan when they can plant their vegetable seeds or transplants and when they can expect to harvest their vegetable crop. The garden calendar shown in the member's guide is only a sample of a graphic picture the calendar may resemble. Members may wish to use a regular monthly calendar for their plan. Either way, as long as the deliberate effort to plan this planting activity is completed, the planning process has been initiated.

You should encourage and expect members to complete these two activities before they attempt any of the following lessons. Your role is to assist them in this endeavor and to improve their chances for having a successful vegetable gardening experience. Taking the time to plan will greatly increase their chances for success.

V. Looking Ahead (to Lesson 3. LIGHT AND TEMPERATURE)

For Experiment 2 From the Arctic to the Tropics, you will need to have three nearly identical samples of warm season and cool season vegetables—not the plants but the actual vegetables. If you want to have individual members do this experiment, you will need to have the appropriate numbers of samples available for each member. Other alternatives are to assign small groups of members to do each of the parts of the experiment, i.e. Treatment A, Treatment B, and so on. Any number of variations of this experiment exist.

Lesson 3. VEGETABLE PLANTS NEED LIGHT AND TEMPERATURE

I. Topic Introduction

The next three lessons introduce youngsters to the environmental factors that affect vegetable plant growth. Of all these factors—light, temperature, water, soil, and nutrients—light is the only environmental factor which vegetable gardeners usually cannot improve in some way. That is the importance of careful site selection.

The first priority in locating a vegetable garden site is to locate a spot that receives at least six, and preferably eight, hours of direct sunlight a day. The best time to receive this sunlight is when it is at its peak intensity—from midmorning to midafternoon, or 9:00 a.m. to 4:00 p.m. If this light arrives earlier or later, then eight hours of light is preferable.

In general, most leaf and root vegetables don't require as much sun in order to produce a good harvest as do fruit and seed crops. Although many vegetables will do well in partial shade, most prefer full sun to maximize their productive capacity. Spring or fall (cool season) crops can get by with less sunlight than summer crops can.

Energy, in the form of light from the sun, is one of the important driving forces in the chemical process known as photosynthesis. This process is very important for the youngsters to understand. Time should be taken during this lesson to show and explain the process (as depicted below) on a chalkboard or flip chart. For a more detailed discussion, you may refer to the references outlined in the Leader's Guide for *Meet the Plants*.

CO_2	**+ H_2O**	**+ LIGHT**	**produces**	**$C_6H_{12}O_6$**	**+ O_2**	**+ H_2O**
carbon dioxide	+ water	+sun	produces	sugar	+ oxygen	+ water

or like this:

carbon dioxide (from the air) **plus water and nutrients** (from the soil)
plus
chlorophyll (green pigment in leaves) **plus energy** (light from the sun)

sugar + water vapor + oxygen

It is important to point out to the youngsters that if the plant has too much or too little of any one of these elements—carbon dioxide, water, or light—photosynthesis can be slowed down or completely stopped. This can cause the plant to stop growing and die, become weakened and subject to diseases, and the production of vegetables will decline. This concept can be explained by making the comparison to how well human beings take care of their bodies. We need to get enough rest, the proper nutrition, and exercise to remain healthy.

Temperature is particularly important when growing vegetables. Extremes in growing temperatures for vegetables may cause any of the following: 1) Stunting plant growth; 2) Fruits—of plants such as tomatoes, peppers, beans (any vegetable that develops from a flower) fall off; 3) Small, deformed fruit develop; 4) "Bolting" (in the lettuce family due to high temperatures) causes an elongated stalk and leaves become tough and inedible; 5) Insect problems increase when excessively hot; and 6. Disease problems increase when the temperatures are too cool.

It is important, then, to know whether a vegetable is a cool season plant (grows best when temperatures are cool—60°-65°) or a warm season plant (grows best when the temperatures are warm - 65°-80°). If youngsters know which vegetable plants are cool season or warm season, they will be able to plant them in the proper month to ensure their best growth and maximum harvest.

II. Purposes and objectives

The youth will be able to:

- identify a vegetable garden site with the best light conditions
- describe what happens to plants that do not get sunlight
- identify and describe the effects of temperature on vegetables

III. Teaching Aids

EXPERIMENT 1. Light for Green Growth

See Member's Guide page 11 for a list of required materials

ACTIVITY 1. I See the Light

See Member's Guide page 12 for a list of required materials

EXPERIMENT 2. From the Arctic to the Tropics

See Member's Guide page 13 for a list of required materials. Also refer to Procedures section for recommended varieties of vegetables to use in this experiment.

IV. Procedures

EXPERIMENT 1. Light for Green Growth

This activity requires the members to use the steps of the Scientific Method in an experiment. You will need to explain the four steps in the Scientific Method. Make sure that you include specific examples of each of the four steps. An example is included in the directions How to Use This Guide found on page 3 of this leader's guide.

Ask them to formulate the hypothesis for this experiment by asking the question "What will we be trying to prove in this experiment?" (Hypothesis: The green leaf blades of grass under the plate will lose their green color) The explanation of the importance of light to plants (page 12) should be brought into the formulation of the hypothesis. In this instance, you may have to help them propose the correct hypothesis until they become more skilled at this concept.

The second step of the Scientific Method, designing the experiment, has already been completed. You may need to help them interpret the initial directions. Some members may be interested in designing other experiments which will prove the same hypothesis.

Collecting data is the third step of the Scientific Method. In order to answer the questions at the bottom of page 11, they have to make observations from the results of the experiment. One important part of the scientific method is making observations to collect data which provides evidence. Remind them of the importance of keeping accurate, neat records.

The questions at the bottom of the page also ask them to draw conclusions based upon their observations. The grass kept under the plate for two weeks would probably be killed due to a combination of extreme temperatures and the chlorophyll being destroyed by a lack of sunlight.

Throughout these discussions, make sure that the members compare and contrast their observations with those of others. Leading the youngsters through this experiment should present you with an opportunity to expand the discussion and allow them to do some brainstorming and problem solving activities. These types of discussions can be made very practical and useful to them in their vegetable gardening projects. For example, how effective are paper plates to prevent weeds growing in their vegetable garden? Are their other types of materials that can be used to keep plants—especially weeds—from growing in their gardens? Are these materials organic or man-made? Which ones will decay naturally? Are mulches effective ways to conserve moisture in the soil?

One result of members doing this experiment and the follow-up discussions could be another series of experiments with mulches. In addition, individuals or groups of members could prepare demonstrations or displays about plant growth and sunlight. Their options are almost endless. See how creative you and your members can be!

ACTIVITY 1. I See the Light

During this activity, members have been asked to observe three potential vegetable garden sites at different times of the day. The intent of this activity is for youngsters to gather valuable information about the availability of sunlight in areas they are thinking about planting.

As the members try to decide which site they will actually use for their vegetable gardens, they need to consider the amount of sunlight each of the sites receives. They will eventually use this information in the process of selecting the eventual site of their vegetable garden.

This activity asks members to make a decision—Which site is best for the vegetables they have selected?—based upon their activity of gathering information and facts. Weighing the data they have collected will help them sort out the good points and bad points of one site and compare them to the other sites. This is the basis for them to practice informed decision-making.

Experiment 2. From the Arctic to the Tropics

In this experiment, it may be necessary to guide the members through the four steps of the Scientific Method again until they have completed this process several times. Although the background information presented in the Member's Guide deals more specifically with vegetable plants than with the vegetables themselves, some of the same generalizations will hold true. The following generalizations (deductive reasoning) will guide you and the members in interpreting the outcomes of this experiment. They should also help you assist the members as they formulate their own hypotheses about each of the treatments. These generalizations include:

- Warm season plants require warm temperatures to produce good quality vegetables.
- Cool season plants require cool temperatures to produce good quality vegetables.
- Depending upon the type of vegetable (cool season or warm season), each type has specific temperature requirements for ripening and storage.

The hypothesis for each of the treatments should be stated similarly to the examples shown below:

- Treatment A—There will be less damage to the cool season vegetable than the warm-season vegetable.
- Treatment B—There will be less damage to the warm season vegetable than the cool-season vegetable.

The most observable results from each of the treatments can probably be obtained by using the vegetables listed below:

Cool-season vegetables	**Warm-season vegetables**
several pods of green peas	ripe tomatoes
whole stems of broccoli	cucumbers
radishes	green peppers

The vegetables that will be placed in the freezer compartment or in the oven are called the experimental group. The other group of vegetables kept at room temperature are termed the control group. For each treatment, you will need to have vegetables that are as similar in appearance and maturity as possible so the results of the experiment can be interpreted uniformly, accurately, and precisely.

The youngsters may be split up into small groups of 3-5 or work on this experiment individually at their homes. Depending upon the arrangements you prefer, there should be several samples of each group (experimental and control) of vegetables placed on a flat plate. For example, two or three cucumbers or four or five radishes or pods of green peas would be found on a plate of either the control or experimental group.

Have the members keep neat and accurate records from each of the activities they perform daily. Their observations should be recorded in the *Record Sheet* as descriptions of the changes that the vegetables in each of the treatments undergo. The questions at the completion of the experiment ask the youngsters to use these observations to describe the changes that occurred in the vegetables. They will also have to deduce from the evidence they have collected the reasons for these changes. Will the data they collected support their hypothesis? Are the generalizations that were mentioned earlier substantiated by the evidence they gathered?

Lesson 4. Vegetables Need Water

I. Topic Introduction

Too much water or too little water probably causes more failures in vegetable gardens than any other condition. This is due to the fact that water is a major component of all living plant cells. The amount varies from 3% in shelled peanut seeds, to 40% in dormant wood, and up to 95% in succulent fruits like watermelon. Water is the medium by which everything is transferred within a plant. Water also maintains the pressure or turgor inside a plant to keep it upright and growing. Without the proper amount of water at the correct time, lettuce can bolt, heads of cabbage can split, tomato blossoms will drop or the tomatoes will develop what is called blossom end rot.

The loss of an excess amount of water may occur quite rapidly under hot, dry conditions in plants that are not structurally adapted to prevent this. Excessive water loss results in the plant stopping growth and its eventual death. The shock of not having sufficient water tells the plant that it doesn't have long to live, so it begins flower and seed development to reproduce itself. As the plant does this, the edible portions of plants change in flavor.

As the plant is watered, the oxygen found in air spaces in soil is replaced with this water. The roots of plants cannot live long in an environment without oxygen. If the soil remains waterlogged too long, plant growth will suffer and the plant may eventually die. Too much water is not toxic itself, rather it is the lack of oxygen in waterlogged soils that causes damage.

Some crops such as the root, leaf, and head crops (carrots, beets, radishes, lettuce, Swiss chard, spinach, cabbage, and broccoli) grow best with a constant supply of moisture. This is because they develop a fairly shallow root system in the top 6 to 12 inches of soil. Fruit or seed crops (tomatoes, cucumbers, peppers, corn, beans, squash, and melons) send their roots deeper and require deep, but infrequent, waterings.

II. Purposes and objectives

The youth will be able to:

- describe what happens to seeds that don't receive the proper amount of water
- measure and record rainfall
- determine the water requirements for three vegetable garden sites

III. Teaching Aids

EXPERIMENT 1. Sprouting Seeds

See Member's Guide page 16 for a list of required materials.

ACTIVITY 1. Let's Measure The Rainfall

See Member's Guide page 16 for a list of required materials.

ACTIVITY 2. How Dry I Am!

See Member's Guide page 17 for a list of required materials.

IV. Procedures

EXPERIMENT 1. Sprouting Seeds

Again, it may be necessary to guide the members through the four steps of the Scientific Method. Each member should be able to develop the hypothesis they will be testing in this experiment (Hypothesis: The amount of moisture present affects the germination of seeds). It may be necessary to refer back to the topic of this particular lesson.

This experiment is simple enough so that each individual member can efficiently accomplish the objectives. However, you may decide that this experiment will be conducted as a class project which will affect the quantity of materials that you will need.

The plate with no water (control group) will be compared with the other two plates (experimental groups). Be sure to have the members discuss their findings. Have them note what happened to the seeds that were soaked in water compared to the ones in the moist paper towels. Is too much water just as bad as not enough water?

ACTIVITY 1. Let's Measure the Rainfall
This will activity should provide the members with a simple device to measure the rainfall that their three vegetable garden sites receive. They can also use this to check the amount of water that they need to apply when they do water. The Rainfall Chart has enough space to record a total of five weeks of daily rainfall. Keeping a neat and accurate record of this rainfall is important for the members to be able to make accurate and informed decisions about which site they will be selecting. You should emphasize that part of scientific method is to make observations (regularly checking the rain gauge) and to record these observations.

ACTIVITY 2. How Dry I Am!
This activity requires that the youngsters make more observations of the same garden sites. The first part of this activity should be completed when they calculate the average rainfall total for each of the three sites. You can demonstrate to them the differences between wet, moist, and dry soil. A good rule of thumb to apply is:
• wet—soil forms into a ball or long ribbons when squeezed.
• moist—soil crumbles and small pieces stick together when squeezed.
• dry—the soil appears to have no moisture at all and when squeezed becomes powdery.

V. LOOKING AHEAD (to Lesson 5. VEGETABLE PLANTS NEED SOIL AND NUTRIENTS)
You and the members will need to start gathering containers for use with the activities and experiments in this lesson. For Activity 1: Sudsy Soil Separator you will need to decide if you want each student to do the experiment or if you want it done in small groups. It will take an appropriate number of glass jars with lids depending on your decision. You will have a similar decision to make for Experiment 1: More Isn't Always Better. Do you want your members to do the experiment in groups or individually? This will take some thought and advance planning.

Lesson 5. VEGETABLE PLANTS NEED SOIL AND NUTRIENTS

I. Topic introduction

Understanding how your soil works is probably the most important part of vegetable gardening. The first step in learning how often and how much to water is to understand the draining capacity of different kinds of soils and how organic matter absorbs and stores moisture.

Soil is a mass of mineral particles mixed with living and dead organic matter and it incorporates quantities of air and water. Clay is composed of very small particles; fine and coarse sandy soil are composed of increasingly larger particles. Silt is a medium sized particle. Small, flat particles of clay fit closely together with little air space between them. When clay soils get wet, they dry out slowly because downward movement of water (drainage) is slow. Since air content is limited, root growth is inhibited.

Sandy soils have comparatively large particles which permit good aeration, quick passage of water, and quick warming. The amount of sand, silt, and clay in a soil is referred to as texture. There are many combinations of the three particles that result in several kinds of textures.

Both sandy and clay soils can be improved by the addition of materials that have the capacity to hold both air and water. The spaces between the soil particles are called pore spaces. Pore space can be illustrated by comparing a screen with nylon stockings. The screen will represent the large pore spaces in sandy soil, and the nylon represents clay soil with small pore spaces. If you dip each in water you can get a pretty good idea of the differences in the two as to how they hold water.

Materials that supply nutrient elements to plants are known as fertilizers. The primary objective of fertilization, the addition of nutrients to the soil, is to achieve an optimum plant response. This means the production of leaves for foliage plants (Swiss chard, cabbage, lettuce, etc.) and flowers for flowering plants (tomatoes, squash, melons, etc.) .

Fertilizers that supply nitrogen (N), phosphorus (P), and potassium (K), the three major plant nutrients, are called complete fertilizers. The fertilizer analysis is the percentage of nitrogen, phosphorus, and potassium respectively. So, a 10-10-10 analysis fertilizer contains 10% nitrogen, 10% phosphorus, and 10% potassium. That means that in a 100 pound bag of fertilizer, 30 pounds would be nutrients and the other 70 pounds would be inert matter or filler. The fertilizer analysis is found on all commercially available fertilizers.

One way to illustrate this concept to youngsters is to put 100 pennies (pieces of candy, peanuts, etc.) on the table which represent a 100 pound bag of fertilizer. Then, separate the pennies into four different stacks. Three of the stacks would contain 10 pennies each, to represent the 10% nitrogen, 10% phosphorus, and 10% potassium. The fourth stack would have 70 pennies to represent the remaining contents of the fertilizer bag. Since we are dealing with percentages, this example will work for any fertilizer analysis (15-15-15, 5-10-5, etc).

A plant's response to fertilization is related in part to the environmental factors such as light, temperature, and water, discussed in previous lessons. A plant requires a favorable environment for all of its parts—roots, leaves, and stems. Generally, nitrogen is responsible for the dark green color of a plant's foliage or leaves. Phosphorus is required for the production of flowers and early root growth, and potassium is necessary for strong and vigorous stem, shoot,and mature plant growth.

II. Purposes and objectives

The youth will be able to:

- list and identify the three types of soil particles
- describe the soil texture from their garden sites
- explain the purposes of fertilizers

III. Teaching aids

EXPERIMENT 1. Sudsy Soil Separator

See Member's Guide page 20 for a list of required materials.

ACTIVITY 1. Getting a Feel for Your Soil

See Member's Guide page 20 for a list of required materials.

ACTIVITY 2. What's Your Type?

See Member's Guide page 21 for a list of required materials.

IV. Procedures

EXPERIMENT 1. Sudsy Soil Separator

The Scientific Method is called for again in this experiment. The correct hypothesis in this case depends upon their ability to recognize the soil type they are testing. In any case, the hypothesis would be stated similarly to others they have previously tested. For example, "The soil is composed mostly of sand particles."

This activity provides one illustration of the fact that most soils are made up of all three soil particle sizes, not just one. Ensure that the youngsters have read and understand the information about the different soil particle sizes before completing this experiment.

There is enough flexibility built into the design of this experiment to make it either an individual or small group activity. Depending upon the availability of the supplies needed to conduct this experiment, the process leaves enough options for you to decide on how to conduct this experiment. This may even be an opportunity for the group of youngsters to decide how they want to carry out this learning experience. Soil from one or several sites may be used in this experiment.

This activity can also be utilized to work with the youngsters on math skills. Although the member's guide calls for measurements in inches, you may want to consider using metric units (centimeters) as well. They can also be encouraged to calculate the actual percentages of sand, silt, and clay present in the glass jar after settling. This is simply done by dividing the total inches into each measurement for sand, silt, and clay. For example, if you have 5 3/4 total inches of soil, and 2 inches of that total are sand, then the percentage of sand in the soil sample is calculated by taking 2 and dividing it by 5.75, which equals 35%. The percentages of silt and clay would be calculated in the same manner.

ACTIVITY 1. Getting a Feel for Your Soil

Now that the youngsters have been introduced to the concepts of particle sizes—sand, silt, and clay—this activity introduces them to soil textures. In particular, this activity provides an excellent opportunity for members to use nothing more than their sense of touch to classify soil. You might also want to consider blindfolding them to see how proficient they can become at "feeling" soil types.

Using kitchen supplies and common materials from their homes should enable these members to relate soil texture to something they are familiar with. It may take practice and experience between the household items and the actual soil before you or your members can distinguish the type of soil that you have.

ACTIVITY 2. What's Your Type?

Based upon their experiences of seeing the soil separated and having felt substances similar to the soil particles, they will now determine the type of soil present in each of their three potential vegetable garden sites. This is an excellent activity to encourage discussion between the members about what they discovered in each of their sites. This activity could even be expanded and made into a contest or activity of determining different soil types from each of the youngster's garden sites; in other words, to see who has the best feel for the soil.

After they have made their determinations, you may have them pair up and justify the decision to their partner. Have the partner confirm or deny the decision of the other person. They would be attempting to justify their decision or determination of the soil texture in their site based upon facts and data that were gathered. This could be decided upon ultimately by doing the Sudsy Soil Separator experiment again in case of any disagreement.

V. Looking ahead (to Lesson 6. PREPARING AND PLANTING YOUR VEGETABLE GARDEN)

Optional Activity—Vegetable Transplant Shopping Fieldtrip

This activity—a fieldtrip—should be taught in combination with Activity 1. The Transplant Doctor and Activity 2. Get Those Seeds. If this is not practical, youth may be encouraged to complete these activities on their own, with their parents or other family members, or with a few members of the club or class.

You should contact the manager or owner of the business you will be visiting at least one week ahead of time to obtain permission and to seek their assistance. Introduce the manager or owner (if possible) and have them show and tell the 4-Hers about the business. This can provide the youngsters with an opportunity to explore a potential career or even a part-time job.

Make sure that the transplants on the Vegetable Planting Chart (Lesson 2) are stocked by the business. This will help you and your youngsters accomplish the purpose of the fieldtrip. Two different businesses are recommended for a variety of experiences for the 4-Hers. You may choose to visit one and have the youngsters visit the second one with their parents or friends.

If warm- and cool-season crops are being grown from transplants, two visits, 4–6 weeks apart, will be necessary. Cool-season transplants should be planted 4-6 weeks earlier than warm-season transplants.

Lesson 6. PREPARING AND PLANTING YOUR VEGETABLE GARDEN

I. Topic Introduction

This lesson is perhaps the most important part of the beginning vegetable gardener's experience. It is important that youngsters succeed in their gardening endeavor and have a valuable and rewarding learning experience. To achieve this goal, it is vital that you provide as much insurance towards their success as possible. There will undoubtedly be some failures and individual plants will probably die, but to maximize these youngsters' success emphasis needs to be placed on planting vegetable seeds or transplants.

II Purposes and Objectives

The youth will be able to:

- Identify and purchase vegetable transplants or vegetable seeds of their choice
- Correctly transplant vegetable plants
- Correctly plant vegetable seeds of their choice

III. Teaching Aids

ACTIVITY 1. Final Site Selection
See Member's Guide page 23 for a list of required materials.

ACTIVITY 2. The Ace of Spades
See Member's Guide page 24 for a list of required materials.

ACTIVITY 3. The Transplant Doctor
See Member's Guide page 25 for a list of required materials

ACTIVITY 4. Get Those Seeds
See member's guide page 26 for a list of required materials

ACTIVITY 5. Record Sheet
No materials required.

IV. Procedures

ACTIVITY 1. Final Site Selection

This is the culminating activity for the preceding two lessons where the members were asked to identify three sites that could potentially serve as vegetable gardens. This is meant to be an individual activity depending upon the ultimate ownership of the garden sites and how you have conducted the previous activities and experiments.

In the previous activities—I See the Light, How Dry I Am, and What's Your Type?—members collected data that should be transferred to the Final Site Selection sheet. This information—Hours of Light, Soil Texture, and Soil Moisture—provides a graphic presentation of important information the youngsters need to make a final decision on which one of the three vegetable garden sites they will select.

They have been asked again to justify or present the facts to a friend that went into their decision-making process. This exercise is practice in thinking reflectively about both the process and the information that has gone into their decision-making process. If part of their thinking process was incorrect, there is a good chance their friend will catch it, question them about it, and ask for clarification. You should double-check the Final Site Selection sheet and their final decision after the sharing activity with their friend.

ACTIVITY 2. The Ace of Spades
This activity is really a hands-on event that parents and other family members can become involved in if the vegetable garden site is located at home. Depending upon the size and location of the site, this activity might ideally be done by the youngster after the formal meeting.

The soil should be amended with any organic matter, fertilizer, or lime that needs to be added. Incorporate and mix these ingredients with a shovel or spade. Make sure the youngsters break up large clods of soil into smaller particles. Remove all large rocks, sticks, and weeds that remain in the areas they intend to plant.

One goal is to have the seedbed composed of small-textured particles of soil no larger than 1/4 inch diameter. The seedbed should be firm for seeds as they sprout but not too compact to prevent germination. After spading or shoveling the garden site,the best way to achieve this ideal seedbed is to rake the soil well, leveling it as much as possible to prevent excessive runoff of soil from rainfall.

ACTIVITY 3. The Transplant Doctor
If the members are transplanting vegetable plants, you should provide a demonstration which illustrates the instructions provided to them in the member's guide. The amount of time this takes will depend upon the number of different demonstrations and individual assistance you will want to offer. Remember, provide them with the basics they need to learn to successfully transplant their vegetables and then let them practice. We all need practice to learn how to perform a new skill well; this is their opportunity to practice and learn. You should provide guidance and direction and not do this for them.

ACTIVITY 4. Get Those Seeds
Again, if the members are planting vegetable seeds, you should provide a demonstration which illustrates the instructions provided to them in the member's guide. Allow enough time so that all of the members requiring individual assistance will receive it. To repeat, provide them with the basics they need to learn to successfully. Provide guidance and direction.

One rule of thumb is to plant seeds twice as deep as the size of the seed. The bigger the seed, the deeper it should be planted. Some seeds require light to germinate and should not be covered at all. The seed package should specify whether or not the seed should be covered and to what depth it should be planted. If seeds are treated with a fungicide, members should use plastic or latex gloves to plant them. Observe safety precautions.

Unlike cool weather vegetables, warm weather vegetables do not tolerate any frost. As was said earlier, warm weather crops should be planted after the last spring frost in your area. Sometimes, however, a frost will still occur after you have planted these crops. It is vital, therefore, that both you and the members listen to weather forecasts and take measures to protect warm weather plants from any upcoming frost.

One way to protect crops is to make hot tents. They are coverings that are placed over individual plants to protect them from frost damage. A simple cover can be made out of milk cartons. Half-gallon plastic-coated cartons or 1 gallon plastic jugs can be used. For the 1/2 gallon carton, cut off the top; leave three sides open during the day so it doesn't get too hot inside, and close it at night to keep the plant warm. Keep the carton in place by anchoring it with soil. For a one-gallon container, simply cut out the bottom, remove the cap, and set the jug over the plant securing it with soil.

ACTIVITY 5. Record Sheet
The purpose of the Record Sheet is to provide members with an opportunity to keep a set of simple financial records which will familiarize them with very basic recordkeeping. These records also allow the youngsters to work with mathematical concepts and figures when they are determining their expenses. More advanced concepts, such as determining the price of each pound of vegetable harvested with the cost of materials and supplies included, or their total labor included, may also be introduced if you feel it is appropriate.

Each of the columns on the Record Sheet are self-explanatory. The Total Harvested should be the number of pounds of each variety of vegetable they have harvested. This can be determined by using a

small scale or having the members use a bathroom scale from their homes. Accuracy is not as important as having the members keep records for there own information.

Record and Review

It is very important for the youngsters to complete this activity. It provides them with an opportunity to think about and reflect on the knowledge and skills they have just learned. Each of the eleven questions covers a particularly important topic within a lesson and there is more than one right answer.

When evaluating a youngster's written responses to each of these questions, carefully consider their basic understanding of the concept discussed. The major concepts presented in Vegetable Gardening basically parallel each of the headings of the six lessons.

New Word Search

All of the words are hidden in the maize of letters in the member's guide.

Sharing With Others and Round-Up Projects

Many different examples of activities to do in small groups, pairs, or individually appear in these two lists. Any of these activities can provide you the opportunity to assess and evaluate the knowledge and skills learned by the youngsters in Vegetable Gardening.

At the end of this lesson are several projects and reviews. It is very important for the youngsters to complete these activities as it will provide them with an opportunity to think about the knowledge and skills they have just learned.