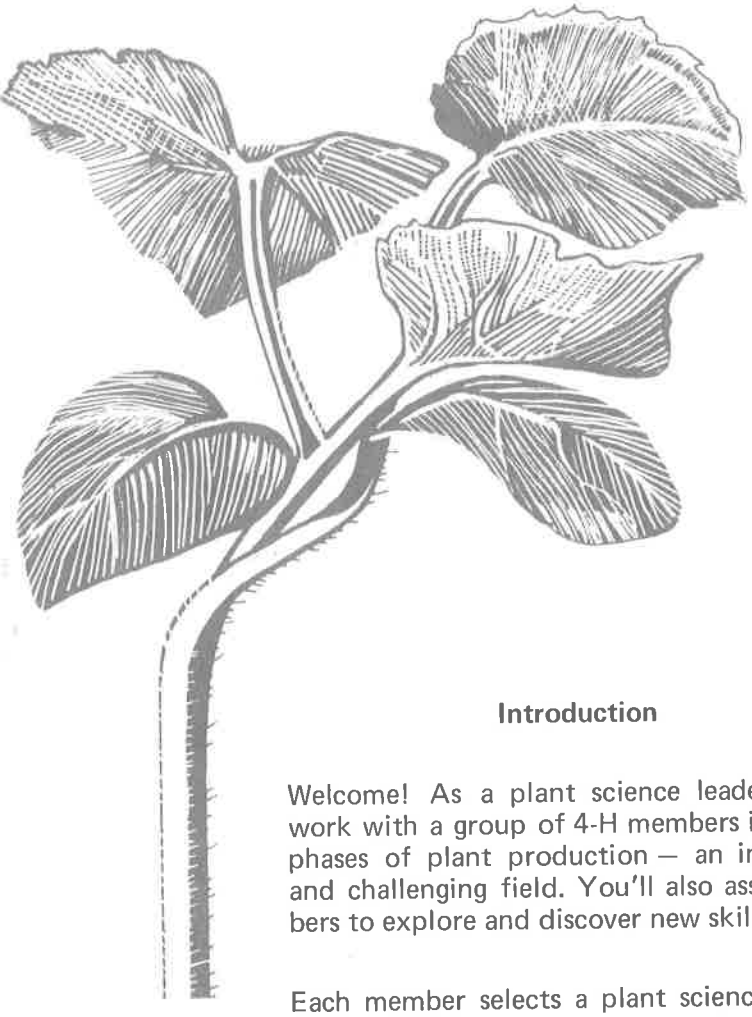


4-H Plant Science Leaders Guide

Be a conservationist! Please save this guide; return it to your county 4-H office when you no longer need it.

Introduction

Welcome! As a plant science leader, you'll work with a group of 4-H members in various phases of plant production — an interesting and challenging field. You'll also assist members to explore and discover new skills.

Each member selects a plant science project that allows him to practice and improve the skills you help him learn. The project is important to the member. It is a means for him to learn, have success, make decisions, assume responsibility, be creative, obtain recognition for worthwhile activity, and gain experience in leadership.

There are many possible plant science projects, ranging from the production of a few ornamentals or herbs to commercial food crops. The member may decide to use flower pots, planter boxes, or mini-gardens for growing plants or he may want to gain experience in lawn care or flower growing, vegetable gardening, crop farming, sugar beet production, growing backyard fruit trees or commercial orchard crops, demonstration plots, identifying weeds or insect pests, managing a farm, or forestry.

Everyone has an interest in plants. All life depends on green plants — the direct or indirect source of most of our food. Plants add beauty to our environment and are part of nature's recycling process, helping keep nature in balance. And plants provide a source of income, either directly or indirectly, for nearly one-third of the people in California.

A 4-H plant science project provides 4-H'ers with an opportunity to:

- develop an interest in plant production
- enjoy the beauty of growing plants
- eat home-grown fruits and vegetables
- combine planning, cultural practices, resources, and management to obtain high production
- study the growth habits of plants
- keep a record of how and when different plants grow
- appreciate the problems of commercial growers, nurserymen, and food stores
- exhibit projects in competition with others
- increase awareness of the importance of quality in agricultural products

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

4-H–80

PRINTED FEBRUARY 1976

- demonstrate skills learned to others
- increase appreciation for the environment
- learn the role of plants in our daily lives, including the economic value to a family, community, state, and nation
- explore career opportunities in plant science
- develop a rewarding hobby
- make critical decisions in different situations

Related learning experiences include:

- preparing and giving demonstrations
- exhibiting products grown in projects
- judging and identification activities
- roadside marketing
- developing community gardens
- community improvement projects
- tours of markets, packing sheds, processing plants, and supermarkets

What Do You Do?

You help each member choose the right kind of project for his abilities, resources, and living situation. It is best if young members grow projects close to home so they can give them better care, improving chances of project success.

Organize and conduct project meetings. Meetings held at a project site are best for discussing and demonstrating skills. Discuss with members the number of project meetings to have.

Show members, individually or in a group, such skills as: how to prepare a seedbed, how to plant, how to fertilize (if applicable), how to irrigate, how to harvest, how to prepare crop for eating, showing, or selling.

Encourage each member to take the right care of his project. Young members, in particular, need lots of help and counsel.

See each member's plant science project and show an interest in what he is doing. A member needs your encouragement, criticism, praise, and approval. Project tours are also valuable since members learn from other members.

Encourage each member to prepare a demonstration about or display of some aspect of his project. Participation in a demonstration contest can be rewarding as can showing at exhibit days or county, district, or state fairs.

Discuss important facts with members. A member needs to know the importance of the crop, how it grows, its uses, typical yield, and potential costs and returns.

Encourage each member to keep written records on his project. Pictures are a good way to record project results. Review each member's record with him at least once during the year.

Encourage and ask parents to help with specific parts of the project or activities.

What Kind of Project Group?

You may be working with members on just one type of project or with members who are taking a variety of plant science projects. Encourage members to invite their friends to join your project group.

When To Start the Project?

It is best to begin the project when the members can start by doing something. The group may begin by starting plants or seeds in pots or by planting directly in a garden or field. Members need to become actively involved in their projects at an early date.

The Project Meeting

A successful meeting requires planning and organization. You may want to use the "Sample Meeting Plan" to help you outline and prepare your meetings. In general, you need to include time for instruction on a skill members need for their project, practice of the skill, and group discussion.

Sample Meeting Plan

Date _____ Time _____

Place _____

Project _____

Topic of meeting (or skill to be taught) _____

Things to do	Who's in charge?	Who's to do it?
Example: Introductory remarks Demonstration of topic Discussion by group Group participation Record review and help Judging or other activity Summary Recreation		

What can members do before next meeting? _____

What is topic of next meeting? _____

What supplies do members need to bring to next meeting? _____

_____

How To Teach

Remember, 4-H members "learn by doing." Use the following steps to guide you when teaching skills that members need for doing their projects.

1. Identify the subject and the purpose in presenting the information.
2. Show how to perform the skill to be learned.
3. Observe and help members practice the skill.
4. Evaluate the results and provide follow-up instructions if needed.

Ideas To Assist You

Have the members elect a chairman to preside at meetings and make telephone calls to remind members of important dates and activities.

Ask an experienced member to become a junior leader to help you lead the project. A junior leader is especially helpful when the members are taking a variety of projects; the junior leader can help some groups while you work with others. Be sure both you and the junior leader clearly understand what each of you is responsible for.

Attend training meetings for project leaders.

Your county Cooperative Extension office personnel are an excellent source of information and assistance.

Seed dealers and nurserymen can also provide you with useful information.

Ask experienced gardeners, farmers, experienced members, and parents to assist with the project.

What Can Members Learn?

A concept basic to all plant science projects is "Learning by Doing." You guide the way, but the members learn – by doing – **what** happens and **why** it happens.

Each member can learn the following information about the particular plant he is working with in his project.

1. Plant identification:
   - make a seed collection
   - harvesting and storing seeds
   - seed certification
   - purpose of plant parts – roots, stems, leaves
   - classification of plants
2. Plant growth and reproduction:
   - the life cycle of a plant
   - parts of a flower
   - what is inside a seed
   - methods of germinating seeds
   - breeding new plants (cross pollination)
   - rooting plants from cuttings
   - propagation from runners and root-stocks
   - propagation by stem tubers
   - propagation from fleshy roots
   - propagation by bulbs
   - starting plants from leaves
   - propagation by layering
   - grafting and budding
   - how plants adapt to climate
   - growth regulators and their purpose
   - plant rooting systems
3. Soils:
   - soil types and characteristics
   - how soil allows plants to grow
   - physical condition of soil and its importance
   - making a soil profile

4. Irrigation (water needs):
   - soil capacity to hold water for plant use
   - water requirements of plants
   - different irrigation methods
5. Fertilization:
   - plant responses to fertilizer
   - different types of fertilizers and their uses
   - fertilization methods
6. Insect pests and diseases:
   - control of plant insects
   - prevention and control of plant diseases
7. Growing practices:
   - weed control
   - transplanting
   - pruning and thinning
   - making a garden in a jar (terrarium)

8. Other learning experiences:

   exhibiting and judging plants

   use of plants

   nutrition

   aesthetics

   ecology

   harvesting

   marketing

   processing

What Related Activities Are Important?

Use tours to produce departments in stores, landscaped houses, garden centers, green thumbers' gardens, commercial farms, nurseries, research farms, processing plants, laboratories, greenhouses, and others to observe and evaluate plant science practices.

Invite experts to meetings to discuss specific topics of interest. (For example, a nurseryman or pest control specialist can add breadth to information provided in meetings.)

Visit fairs so members can observe displays and exhibits. This can be a big help for members who want to prepare displays or exhibits.

Judging activities and identification contests add interest to the project.

Members can prepare and present demonstrations to share skills learned with others.

Learn about the nutritional value of plants.

Explore the importance of food and fiber production in our national and world economies.

References

These materials may be obtained from your county 4-H office.

1. Plant science reference manuals for members and leaders:

   Unit I, *Exploring the World of Plants and Soils*;

   Unit IIa, *Plant Reproduction*;

   Unit IIb, *Soils*;

   Unit IIc, *Plant Growth Factors*;

   Unit IId, *Plant Characteristics*;

   Unit IIe, *Growing and Using Plants*.

2. 4-H project literature available also includes materials on: commercial orchard or crop projects; cotton and sugar beet projects; fertilizer test plots; forestry; home grounds beautification; plant propagation; vegetable crops and growing vegetables in mini-gardens; and weed identification.

3. *A Child's Garden*. Published by Chevron Chemical Company.

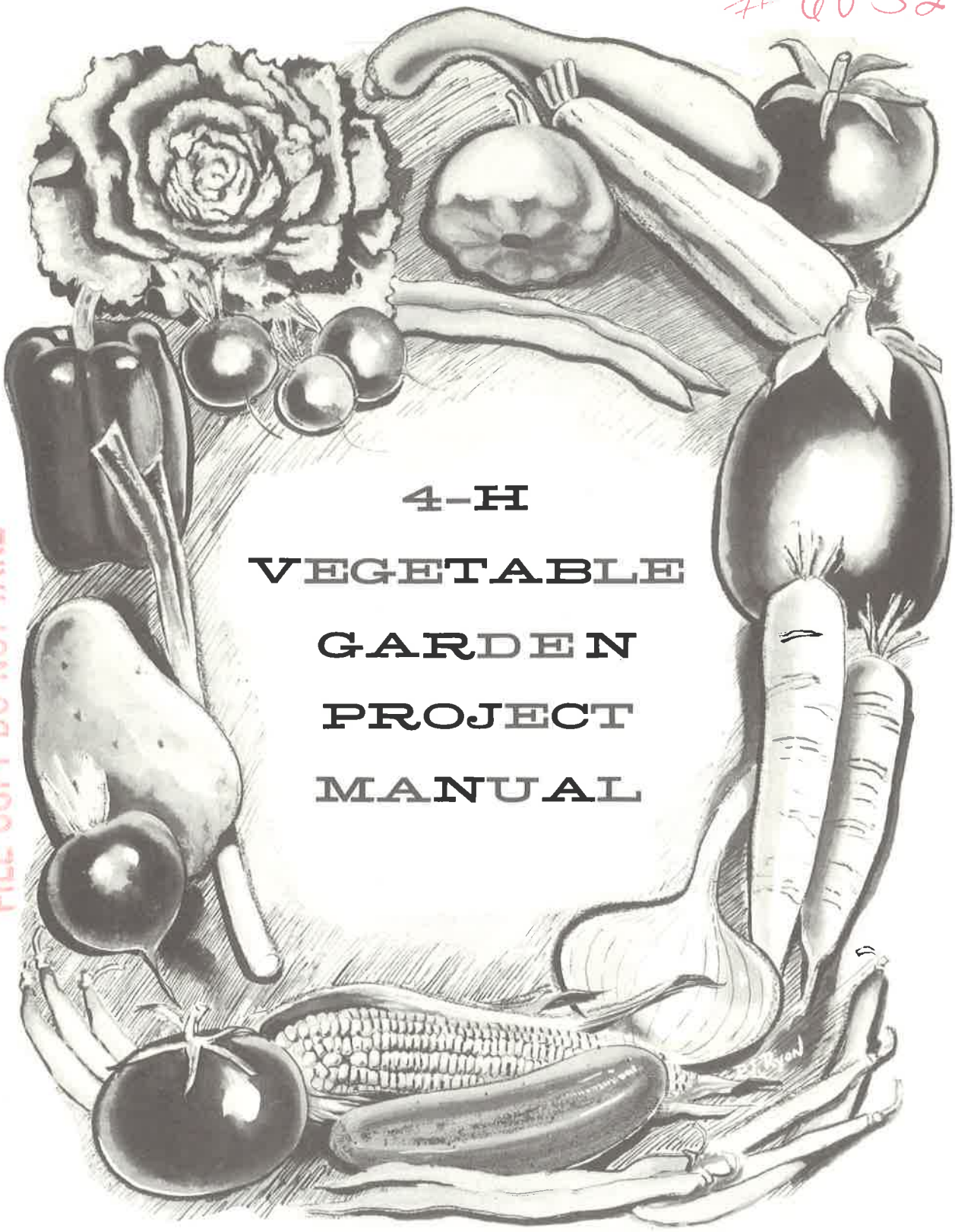
4. Project leader guides.

5. Check with your county office for other publications on various phases of plant science.

6. Publications from nurseries, seed dealers, and public libraries.

Prepared by 4-H Plant Science Literature Committee members:

H. L. Miller, State 4-H Youth Specialist, Davis;
R. E. Voss, Extension Vegetable Specialist, Davis;
R. C. Gay, 4-H Youth Advisor, Yolo County;
I. B. Campbell, 4-H Youth Advisor, Butte County;
F. R. Kegel, Farm Advisor, San Joaquin County;
J. A. Newman, 4-H Youth Advisor, Solano County;
and
D. Rodriguez, 4-H Youth Assistant, Sacramento County.



4-H VEGETABLE GARDEN PROJECT MANUAL

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

REVISED MARCH 1976

4-H Ag 13

This publication was originally prepared by the 4-H Vegetable Crop Committee composed of: William L. Sims, Extension Vegetable Specialist, Davis; A. D. Aulenbacher, State 4-H Youth Specialist, Riverside; Harry L. Miller, State 4-H Youth Specialist, Davis; Vincent H. Schweers, Farm Advisor, Tulare County; Thomas M. Little, Extension Biometrician, Emeritus; John P. Underhill, Farm Advisor, Emeritus; and Torrey Lyons, Farm Advisor, Emeritus.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. James B. Kendrick, Jr., Director, Cooperative Extension, University of California.

INTRODUCTION

In this project you will plan and grow a garden of fresh vegetables. You will start with a small garden the first year and probably use all you produce in your home. As you expand your project in following years, you may produce enough vegetables for home canning and freezing, or for marketing.

Your Garden Project will teach you many useful things about plants – growing habits, fertilizing, irrigating, and pest control. This information will be helpful to you when you have other projects with larger market gardens or specialize in single crops.

Plan to plant each vegetable at the time it grows best in your locality. Use the planting guide table on page 12. Consult your leader or Farm Advisor for best varieties and planting dates.

4-H Project Requirements

Here are the minimum requirements for 4-H Club members in the Junior and Hi 4-H Vegetable Garden Projects:

JUNIOR 4-H

FIRST YEAR. If you are 10 or 11 years old and this is your first garden project, you are expected to grow three or more kinds of vegetables in a garden of at least 150 square feet.

SECOND YEAR. If you are 11 or 12 years old and this is your second project, you should grow at least 5 kinds of vegetables and your garden should occupy 300 square feet or more.

THIRD YEAR. For the third year, you must have at least a 600-square-foot garden and at least seven kinds of vegetables.

HI 4-H

After you have had two or three years experience with garden projects, you are expected to expand into a market garden or a commercial acreage of a single crop.

In your market garden, you may wish to specialize in a few vegetables, which have grown especially well in your garden. In this case you should use two or more planting dates for each kind of vegetable to extend your harvest season over a longer period.

Or you may wish to grow a larger number of vegetables to provide your customers with a wide variety of fresh produce throughout the season.

Details about Hi 4-H projects are listed on page 8 of this manual.

The vegetables listed below do well in a home garden. There may be others that grow especially well in your region. Ask your leader or Farm Advisor for planting suggestions.

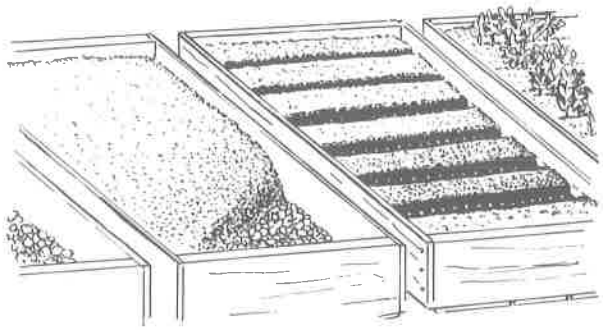
Snap Beans	Okra
Beets	Onions
Carrots	Peppers
Sweet Corn	Potatoes
Cucumbers	Radishes
Eggplant	Summer Squash
Lettuce	Tomatoes

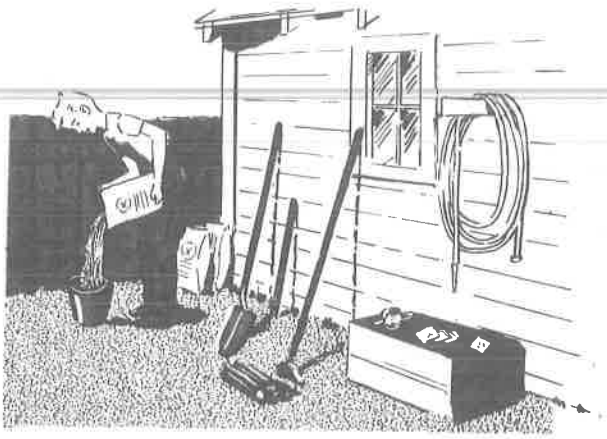
You Will Need

You can locate your project in your backyard, in your parents' home garden, in a vacant lot near your house, or in a convenient spot around the farm. It is important to consider these points:

1. Your project should be near your home where you can care for it easily.
2. Ample water should be available.
3. Level ground is best for growing vegetables. It is easier to prepare, plant, and irrigate than sloping ground.
4. The plot of ground should get full sunlight throughout the day. Do not plant vegetables where they will be shaded by trees, shrubs, walls, or fences.
5. The soil should be in good condition. Vegetables grow best in a loose, fertile, well-drained soil. Good vegetables can be grown in almost any soil, however, if it is properly handled.

SEED AND PLANTS. You will grow most of your vegetables from seed. Some others, however, such as tomatoes, onions, peppers, and eggplant, are usually transplanted as small plants into the garden. Transplants can be obtained from local seed stores or commercial growers. Older club members may want to grow their own transplants.





Buy only good quality seed. Be sure the seed you buy is fresh. Some seed will not sprout well after about one year. Check the date on the seed package.

A suggested list of vegetable varieties is listed on pages 8-10. Check with your local Farm Advisor or seedsman about varieties best adapted to your area.

EQUIPMENT. You will not need to use many tools in a small garden. You will need a shovel or spading fork, hoe, rake, yardstick or tape, garden hose for irrigation, hand duster or sprayer, stakes, and string to mark rows and for tying. As your project becomes larger, you may want to get a small hand-wheel cultivator to help in weeding and making furrows.

FERTILIZERS. Manure is a good fertilizer. If available, it may be used to supply your garden soil with a portion of the nutrients needed for plant growth. Manure also adds organic matter to the soil. The manure should be fairly free of weed seeds. Apply at the rate of one-half to one pound per square foot.

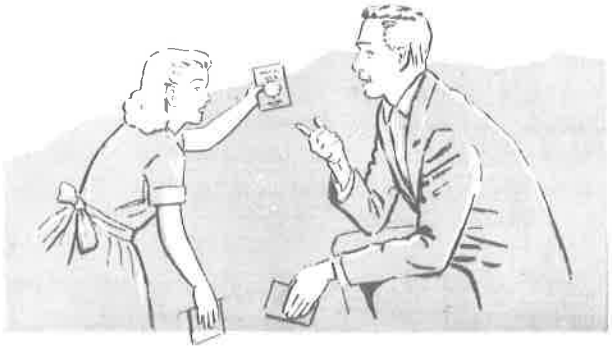
In most parts of California, 16-20-0 ammonium phosphate (16% nitrogen, 20% phosphoric acid, no potash) is a good fertilizer for vegetable gardens. Use one pound for each 15 feet of row.

In a few areas a complete mixed fertilizer is desirable. In some cases only straight nitrogen fertilizer is needed. Ask your leader or Farm Advisor about this.

PEST CONTROL MATERIALS. Various insects and diseases may cause heavy losses in the vegetable garden if the proper control measures are not taken. Ask your leader or Farm Advisor for the up-to-date control measure which should be taken for the vegetables you grow in your garden.

Planning the Project

After you sign up for a 4-H Vegetable Garden Project make your plans. Decide where you will grow your garden and what vegetables you will plant. The planting guide on page 12 tells what crops can be grown, when they should be planted, and how much space will be needed for each vegetable. After you have decided what to plant, read the notes on these crops in the section starting on page 8.



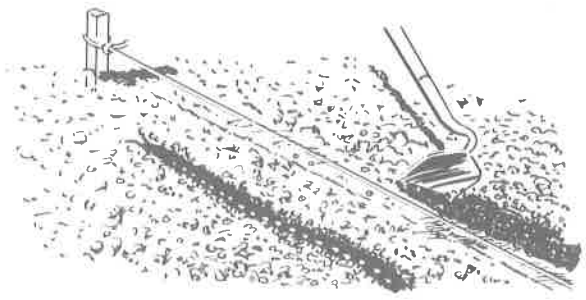
JOBS I NEED TO DO	WHEN THEY SHOULD BE DONE
1. Order supplies (seeds, plants, fertilizer)	
2. Prepare ground	
3. Plant seed	
4. Set out plants	
5. Irrigate	
6. Dust or spray for insects	
7. Harvest	
8. Market	

SOIL PREPARATION. The soil for your garden should be spaded or plowed to a depth of 5 to 8 inches. At the same time all old crop residue and trash should be turned under. If manure is used it should be turned under in the same operation. If possible, do this in the fall or at least several weeks ahead of planting to allow the organic matter to start decaying. The soil should not be worked when it is wet.

FERTILIZE AND PLANT. In most parts of California 16-20-0 ammonium phosphate (16% nitrogen, 20% phosphoric acid, no potash) is a good fertilizer for home gardens. In a few areas a complete fertilizer may be desirable. You can ask your leader or Farm Advisor about what to use if in doubt. About one pound of 16-20-0 should be applied to each 15 feet of row. On light sandy soils or for long-season crops it may be desirable to add some extra fertilizer in the middle of the irrigation furrow when the season is half over. This is a form of side dressing. One-half pound to each 15 feet of row may be used.

Vegetables can be planted on the flat or on raised beds. Use a string to set straight rows. Put fertilizer in the soil before seeds or transplants are planted.

When flat planting is used, make a narrow or pointed trench about five inches deep on one side of the string. Spread the fertilizer evenly in the bottom of the trench. Then fill the trench. On the other side of the string make the shallow trench for the seed or place the transplants at intervals along the string.



If beds are used, put the fertilizer in trenches and then make the bed over it. The beds can be made by pulling up the soil with a rake. Put fertilizer at least six inches below the level of the seed. Firm the beds slightly before the seed or transplants are planted. The beds can be raised from four to six inches above the ground level and be 12 to 16 inches wide on top. They should be 32 to 36 inches from center to center.

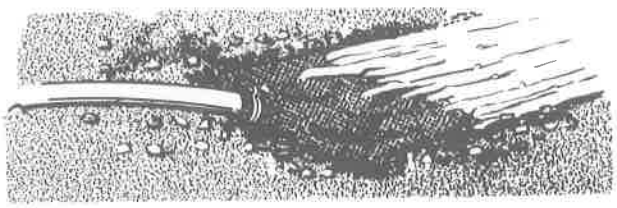
PLANT AT PROPER DEPTH. In moist soil cover small seeds (such as spinach and lettuce) with ¼ inch of soil. Medium-sized seeds (such as carrots and parsnips) are covered to a depth of ½ inch. Large seeds (such as peas, beans, and corn) should be covered with about one inch of soil. In light soils, or when moisture is deficient, plant seeds somewhat deeper.

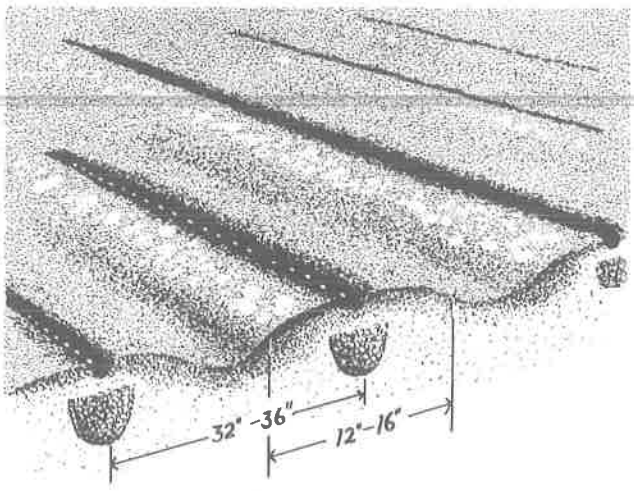
CULTIVATION AND WEED CONTROL. Cultivation is not used for breaking clods or stirring soil. This is done when you prepare your garden for planting. Cultivation is for killing weeds. Weeds crowd your vegetables and rob them of sunlight, nutrients and water. Do not let weeds grow in any part of your garden. They will produce seed which will grow next year. The best cultivating tool is usually a sharp hoe.

Do not hoe too deeply. Hoeing too deeply injures the crop roots and brings up deep weed seeds which will sprout. Weed seed deep in the soil does not sprout.

IRRIGATION. Soil moisture is needed for all stages of plant growth. Yield or quality is lowered when plants suffer for water.

Roots will drown if the soil stays too wet. This is most likely to occur on heavy soil or where drainage is stopped by hardpan. (Hardpan is any hard, unbroken, compacted layer in the soil through which it is difficult to dig and which roots and water will not penetrate.) High beds with deep furrows will give your plants better drainage on these soils.





Irrigate your garden with furrows or a sprinkler. Some gardeners use sprinklers to start vegetables and change over to furrows after the plants are up. Sprinklers must be placed so that the water covers the area evenly. It is also important to leave them at each location long enough to moisten the soil as deep as the deepest plant roots.

Be sure furrows are level in order to fill evenly. Tie a cloth sack over the end of your hose so it will not wash down your plant beds. Be sure to use enough water each time to wet the soil thoroughly where your plants' roots are growing.

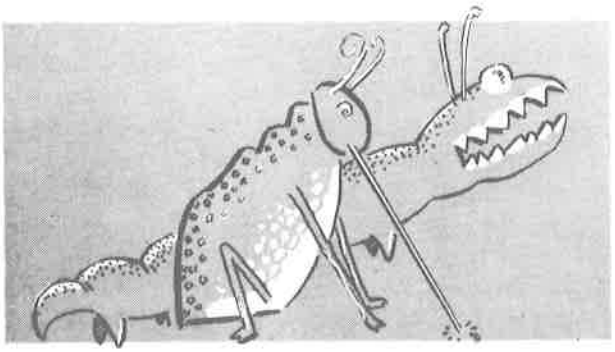
It is very important to irrigate at the right time and to use the right amount of water.

Some of your vegetables will develop deep-root systems; others will have shallow roots. Shallow-rooted crops need water more often than the deep-rooted ones, which can go much longer between irrigations because they reach into more soil. Deep-rooted crops, however, need more water at each irrigation because they use more water. Small plants may need frequent light irrigations.

Light soil does not hold as much moisture as heavy soil. Therefore, irrigate more often on light soil.

Irrigation must be more frequent in hot weather than in cool because plants use more water then.

Many factors change your irrigation needs. Plants must always have soil that is moist but not so wet that the roots are drowned. This may require irrigation as often as every four days or as seldom as every four weeks.



PEST CONTROL. Pests should be killed before they cause serious damage.

There are two general kinds of insect pests—chewing and sucking insects. Most chewing insects (such as beetles, worms, and caterpillars) are controlled by insecticides which act as stomach poisons or poison on contact with the insect.

Sucking insects (such as aphids, mites, and leaf hoppers) are controlled by contact poisons.

The root-knot nematode is a very tiny worm. It invades the roots of many garden plants, grows there and causes the formation of galls or "knots" on the roots. If this pest is known to be present, choose another garden location. If this can not be done, the soil should be fumigated.

Occasionally wireworms are a pest in the home garden. They are tough, jointed, shiny orange worms one-half to one inch long. They feed on plant roots and often kill newly planted vegetables. If their presence is known or suspected, control measures should be taken.

Most of the diseases and insect pests that occur in California vegetable gardens can be controlled successfully with the use of chemicals. Ask your leader or farm advisor for the most recent methods of control.

Most pesticides are poisonous—handle them with care. If you are planning to use chemcials to control pests in your garden, ask your parent, leader, or farm advisor to help you apply them. Read the directions on the label carefully, and follow the manufacturer's recommendations exactly.

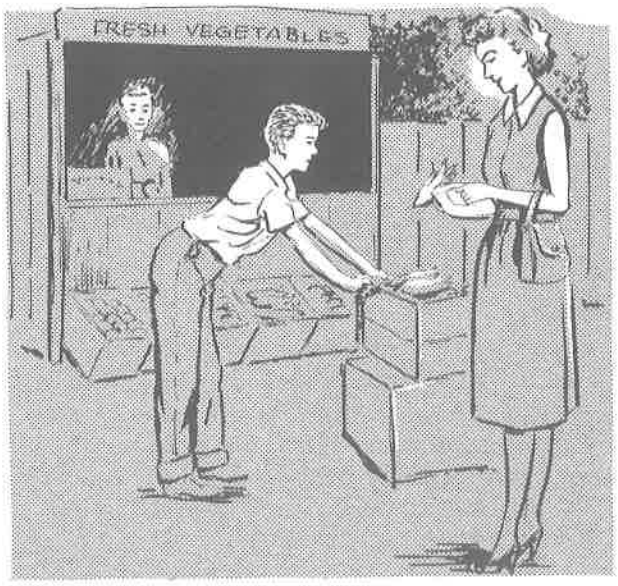
HARVESTING. Harvest your vegetables carefully. Avoid bruising, tearing the flesh or stems, and other injuries. A sharp knife is used to harvest many leafy vegetables and will also be useful in picking peppers, eggplant, and some vine crops. Use a spading fork or shovel to loosen the soil before you pull root crops.

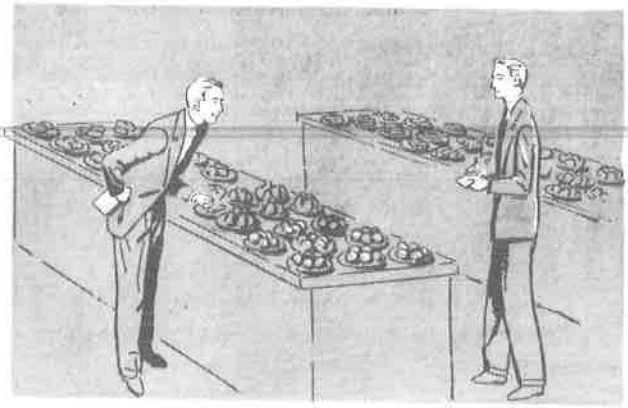
Some vegetables (such as potatoes, sweet potatoes, and onions) may be harvested several days before marketing.

Harvest other vegetables as close as possible to the time of marketing. Some vegetables wilt quickly. Lettuce, snap beans, sweet corn, and others should be picked the morning of the marketing day to be fresh for marketing. To get the most value from your vegetables, harvest them when they are best for eating.

MARKETING. Sell only good quality produce. It brings premium prices and is always easy to sell. A buyer who receives poor quality vegetables usually will not buy again. After harvesting sort out all unsalable vegetables. Culls include vegetables with rot, worm damage, mold, deformity, and excessive damage from sunburn, growth cracks, mechanical injury, and other defects.

Be sure to clean your vegetables. You may sell your vegetables in small lots by the pound, box, or bunch. You may establish a vegetable route in your neighborhood. Local grocery stores or fruit and vegetable stands are often eager to buy good quality fresh vegetables.





RELATED ACTIVITIES. A vegetable garden helps you learn other things when you participate in related activities. You will exhibit at 4-H and other fairs. You can develop and give demonstrations to teach others the things you have learned, identify varieties of vegetables, of weeds, insects, or diseases that affect vegetables, and judge vegetables and participate in grading contests set up by your leader.

Tours of 4-H vegetable projects, vegetable farms, processing plants, and packing sheds provide learning opportunities for 4-H vegetable project members..

When you exhibit your vegetables at a fair, select the best specimens at the time of harvest. For exhibiting ideas, read the California 4-H Publication 4-H – Ag4 How to Prepare Vegetables for 4-H Exhibits.

For Older Members

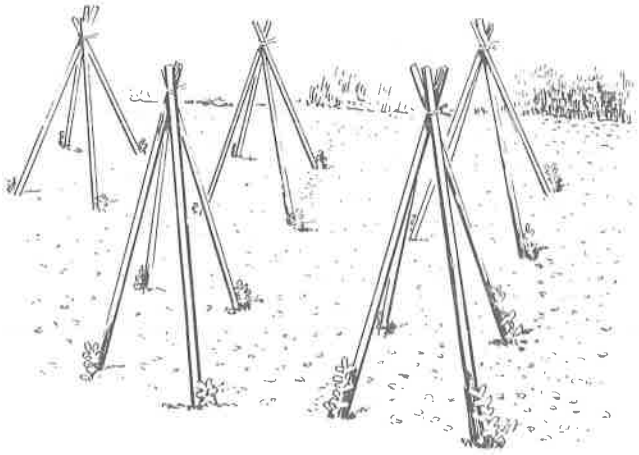
Hi 4-H MEMBERS are expected to expand their project into an acreage large enough to raise vegetables to market outside the home.

1. A minimum market-type vegetable project would be about 1/10 of an acre in size. Some cultural practices might be done with farm machinery.
2. You may continue this as a regular home garden project. You should increase the number and amount of your crops with future projects or you may take one or two crops as single crop projects.
3. You will need to expand your marketing activities. This may mean a bigger route, a vegetable stand of your own, or increased sales to local stores. Vegetables may also be sold to a processor for freezing or canning.
4. You may follow other specialized projects too, such as growing nursery stock, or conducting a test plot in cooperation with your Farm Advisor.

NOTES on Individual Crops

SNAP BEANS are classified in two types according to growth habit. The pole types are climbing and require supports. The bush types require no support, but do not yield for as long a period as pole types. Each type has both green-podded and yellow-podded or wax varieties. The common varieties of bush beans include Stringless Green Pod, Tendergreen, Bountiful, and Pencil Pod Wax. Pole types include Kentucky Wonder and Blue Lakes.

In small plantings, pole beans are generally planted in hills about two feet apart with five or six seeds per hill. Rows are planted in pairs, with the hills of one row opposite those of the other. When the plants start to send out runners, poles about six feet long are driven alongside each hill. Groups of four poles (two from one row and two from the other) are tied together at the top in the form of a tepee.



Bean seed should be planted only when the soil is warm. Otherwise it will not germinate well. Since bean seed is very susceptible to rotting in the soil and to worm damage, it should always be treated with a combination fungicide and insecticide. Treated seed can be bought in most seed stores.

BEETS thrive best in cool weather but will go to seed if subjected to long periods of near-freezing weather. The best planting times in most parts of California are early spring or fall. In the warmest parts of the state they can be planted throughout the winter. Each beet "seed" is really a cluster of seeds. It is very important to thin to single plants about two inches apart after the plants are one or two inches high. The common varieties are Detroit Dark Red and Crosby's Egyptian.

CARROTS which grow well in home gardens are Imperator and Danvers Half Long. Carrots are easy to grow and require no special care, except to work the soil deep before planting, and then thin plants to two inches to allow the roots to become well developed.

SWEET CORN is generally very satisfactory for a garden. A strain of Golden Cross Bantam is recommended. It is better to have two or more short rows than a long single row, to assure good pollination to produce well-filled ears. Corn seed requires warm soil for good germination, and should be treated to prevent rotting and seed maggot attacks.

Sweet corn loses quality rapidly after picking, especially in warm weather. Therefore it is best to harvest it immediately before use or sale.

CUCUMBERS for slicing are best for gardens. These can also be used for pickling by picking when the cucumbers are small. Common varieties are Long Green and Marketeer. Cucumbers are easily damaged by frost and should not be planted until the weather is fairly warm. Plant four or five seeds every two feet and thin to single plants. It is important to keep the plants well watered. Otherwise the cucumbers will tend to be bitter.

EGGPLANT is grown in many home gardens. The variety Black Beauty is suggested. Eggplants do not grow well in cool weather. If transplants are not available, you can use seed. Seed planted when the weather is warm enough in the spring will produce mature fruit in the fall. If an early harvest is desired, transplants may be used instead of seed.

LETTUCE has two main types – leaf and head. Among the leaf types, common varieties are Black Seeded Simpson, Salad Bowl and Cos or Romaine (a loose-head type). The head type includes Great Lakes and Imperial strains. The Imperial strains are adapted only to winter production in the southern part of California. Great Lakes tolerates some warmer weather.

All lettuce is very sensitive to high temperatures and should be grown only during the cool seasons of the year.

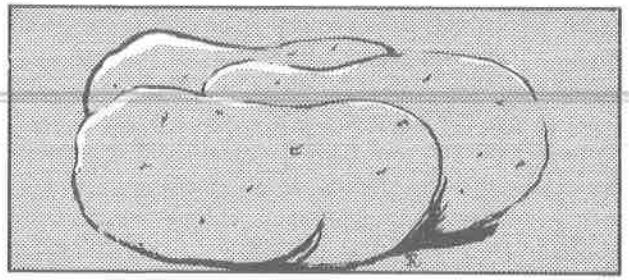
OKRA is strictly a warm weather crop and requires a rather long season to reach fall production. It should not be grown in localities with a short warm season. Clemson Spineless and White Velvet are well known varieties. It must be harvested every day or two after it starts bearing, for the pods grow very fast and soon become tough and inedible. Pods are of best quality if picked when two or three inches long.

ONIONS can be grown in three ways – from seed, from dry sets, or from green transplants. Growing from seed is the cheapest, but is more difficult than the other two methods. Growing from dry sets is very easy, but these are often not available in the varieties best suited to California. Green transplants can usually be purchased from seed or nursery stores. You can grow them yourself by planting seed in a flat or small seed bed. The best early varieties are Early Grano, Granex, and Yellow Bermuda. These are well adapted to southern California. Stockton Yellow Globe is a medium-early variety well suited to the San Joaquin Valley. Sweet Spanish and Southport White Globe are late varieties which do well in the northern half of the state and coastal counties. Onions are ready to harvest when the tops fall over. After digging they should be thoroughly dried but protected from direct sunlight before placing in storage.

PEPPERS suggested for the home garden are the large, fruited, bell-type peppers. These are also the most popular on the market. California Wonder and Yolo Wonder are two of the standard varieties in California. Peppers may be started from seed in a hot bed or cold frame and transplanted. It is preferable for younger members to buy plants from a nursery or commercial grower and set them out in the garden. Fruits are generally harvested when fully sized and still green. Some people prefer to leave them on the plant until the pepper has turned red.

POTATOES are interesting to grow, but other vegetables are more useful, for small gardens. Use Pontiac for a red potato, White Rose for a long, white potato, and Netted Gem for a russet potato.

Potatoes used for planting should be "certified" seed potatoes from a seed store. If you plant grocery store potatoes, your crop could be a com-



plete failure because of disease. You will need a pound of potatoes for each ten feet of row. Just before planting, cut them into one- to two-ounce pieces which have at least one eye. This is the bud from which a new shoot will grow.

Start the planting by digging a trench five inches deep and six inches wide. Sprinkle your 16-20-0 fertilizer along each side of the furrow. Throw just enough soil back into the furrow to cover the fertilizer. Place your potato seed pieces down the center of the furrow, ten inches apart. Now cover them with six to eight inches of soil, forming a bed with an irrigation furrow on each side.

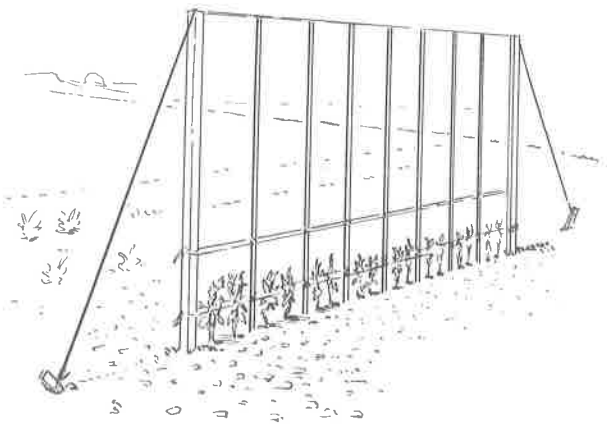
Potatoes should be kept quite moist during the growing season. When the vines start to turn yellow or brown, stop irrigating. This is usually 100 to 120 days after planting. Dig your potatoes when the soil becomes dry enough to crumble easily. A spading fork is best for this job, but a shovel will do. Work from the side of the row and dig deeply to lessen the damage to your potatoes.

SUMMER SQUASH is easily grown with several good varieties available including zucchini, Summer Straightneck, Yellow Crookneck, and White Bush Scallop. Under good growing conditions, fruits are ready for first harvest 50 to 65 days after the seeds are planted. The squash are cut when immature. When harvest commences the plants should be picked every day or two.

RADISHES are a short season crop and are easy to grow. They are generally ready to pull three to four weeks after the seed is planted. Two rows are planted in each bed, or with two feet between rows or sown broadcast. The seed is planted with three to four seeds to the inch of row, and harvested several times so that the larger radishes are removed first. Suggested varieties include Scarlet Globe, Sparkler (red), Early Scarlet Turnip (white tip), White Icicle (white).

TOMATOES can be grown easily. Varieties include Earliana, Ace, Earlypak, and Pearson.. Tomato transplants can be set out after the danger of frost is over. Tomatoes may be staked or may be allowed to grow normally spaced three to four feet apart in rows four to five feet apart. For staked tomatoes the plants should be spaced two feet apart in the row.

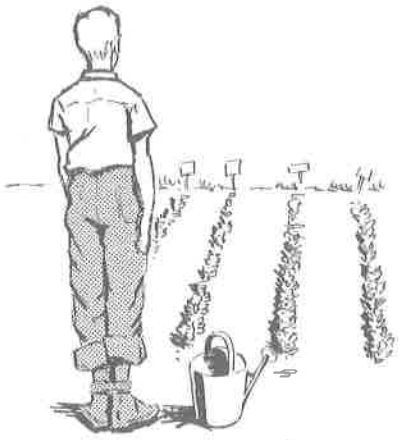
Tomato plants can be tied to single stakes at six- to eight-inch intervals up the stake. The stake should be four feet tall after it has been driven eight to ten inches into the soil. Another method commonly used is illustrated below. Set a 2-by 2-inch grape stake or post about six feet tall at each end of your row. Brace these with a wire attached to a small stake driven about three feet from the end of the row. Next drive a 1-by 1-inch stake between every other plant. When the plants are about ten inches tall tie an ordinary white string about eight inches above the ground to one end stake. Run the string to the next stake, loop it around and continue on to the end of the row. Keep the string tight as you go. Now turn back and run the string along the other side of the plants. Loop this string around the first string between the plants. As the plants grow add another string every six to seven inches. About every third string should be stronger to give extra support. Continue the stringing as long as the plants grow.



You may obtain these reference publications from your Farm Advisor's office:

4-H Leader's Manual for Vegetable Crop Projects	(California 4-H Publication 4-H – Ag5)
How to Prepare Vegetables for 4-H Exhibits	(California 4-H Publication 4-H – Ag 4)

Your county Cooperative Extension office has movies, slide films, and slides on vegetable crops that you may borrow for your club meetings.



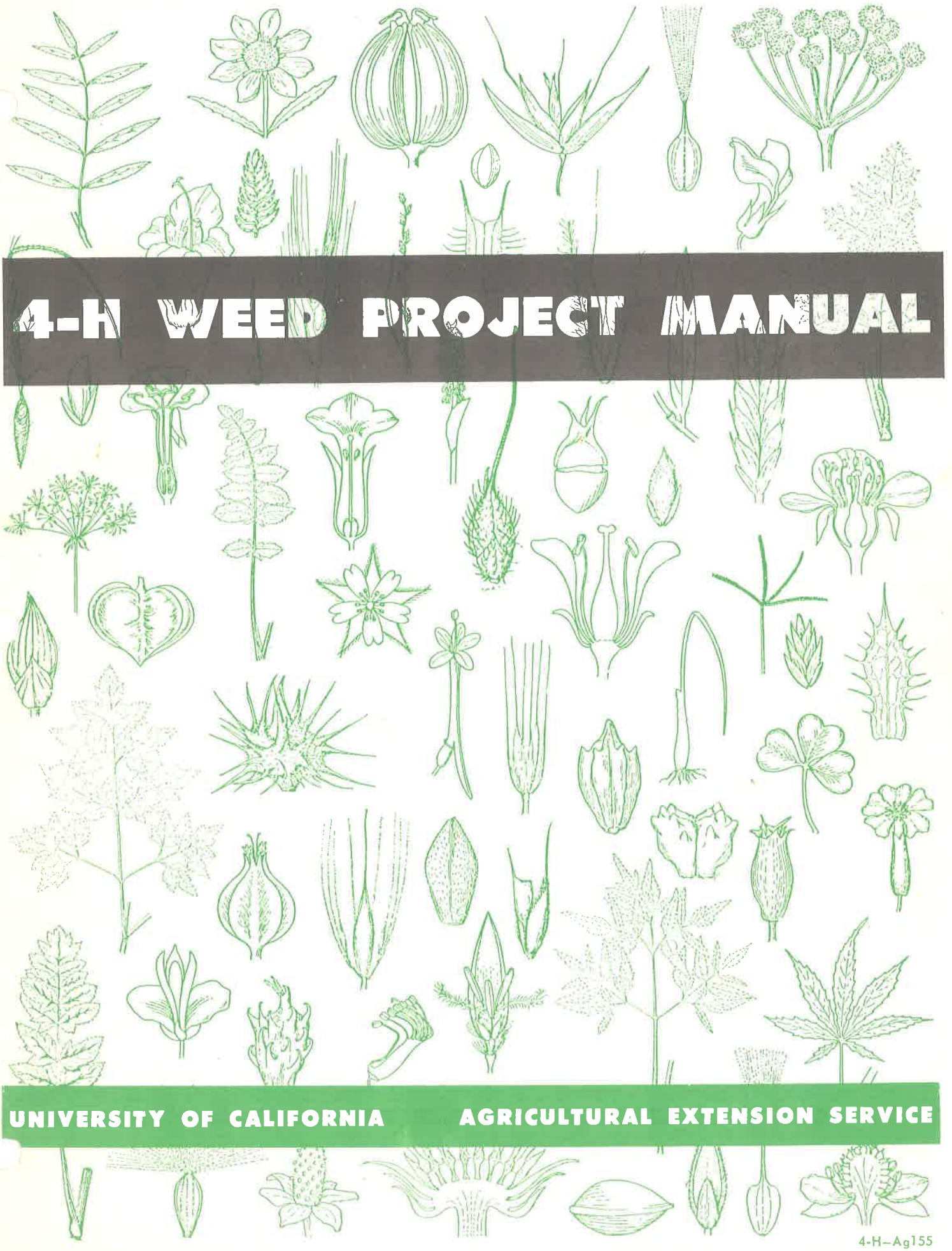
Learn By Doing

PLANTING GUIDE

Planting dates for sections of California (Climate may vary within each section. Consult your leader or Farm Advisor for exceptions in your locality.)

VEGETABLE	North Coast counties. Monterey Co. North	South Coast counties. San Luis Obispo Co. South	Interior Valley counties. Sacramento, San Joaquin and similar valleys	Imperial and Coachella valleys	Moderate planting for family of 4	Distance apart in row	Planting depth inches	Rows per 32"-36" bed	Days to Maturity **
Snap Beans	May-July	Mar.-Aug.	Apr.-May,July*	Jan.-Mar. Aug.*	15-25 ft. row	3" bush 24" pole	3/4-1	1	40-65 60-80
Beets	Feb. or Aug.	Feb. or Aug.	Feb. or Aug.	Sept.-Jan.	10-15 ft. row	2"	3/4-1	2	45-80
Carrots	Jan.-Aug.	Jan.-Aug.	Feb. July-Aug.*	Sept.-Dec.	20-30 ft. row	2"	1/2	2	65-90
Sweet Corn	Apr.-July	Feb.-July	Mar.-July	Jan.-Mar. Aug.*	20-30 ft. in 4 rows	15"	1-1-1½	1	60-100
Cucumber	Apr.-June	Apr.-June	Apr.-June	Feb.-May Aug.*	6 plants	24"	3/4-1	1 row to 2 beds	60-90
Eggplant	May	April	April-May	Feb.-Aug.	4-6 plants	24"	1/4-1/2	1	120-150
Lettuce	Feb.-Aug.	Dec.-Aug.	Aug.* Nov.-Feb.	Sept.-Dec.	10-15 ft. row	12" head 6" leaf	1/4-1/2	2	60-90
Okra	May	April	May	March	10-20 ft. row	18"	1-1-1/2	1	60-140
Onions	Jan.-Mar.	Nov.-Feb	Nov.-Feb.	Nov.-Jan.	30-40 ft. row	3"	1/2-1 sets 1-2	2	100-150
Peppers	May	Apr.-May	May	March	5-10 plants	24"	1/4-1/2	1	100-140
Potatoes	Early:Feb. Late:Apr.May	Early:June-Feb. Late: Mar.-Aug.	Early:Feb.- March Late: August	- - -	50-100 ft. row	10"	6	1	80-140
Radishes	All year	All year	Sept.-Mar.	Oct.-Feb.	4 ft. row	1"	1/2-3/4	2	20-75
Summer Squash	May	Apr.-June	Apr.-June	Feb.-Mar. Aug.*	2-4 plants	24"	1-1-1/2	1 row to 2 beds	50-65
Tomatoes	May	Apr.-Aug.15	Apr.-May	Feb.-Mar. Aug.*	10-20 plants	24"	1/4-1/2	1	100-140

* Fall Plantings
** Depends on weather conditions and variety



4-H WEED PROJECT MANUAL

UNIVERSITY OF CALIFORNIA AGRICULTURAL EXTENSION SERVICE

4-H–Ag155

The authors are Franz Kegel, Farm Advisor, San Joaquin County, Harry Miller, 4-H Club Specialist, and David E. Bayer, former Extension Weed Specialist.

The authors acknowledge the assistance of the following persons in planning and reviewing this manuscript.

Ronald Baskett, Farm Advisor, San Joaquin County
Alden Crafts, Chairman, Botany Department, Davis
Beecher Crampton, Associate Specialist, Experiment Station, Davis
Bill Fischer, Farm Advisor, Fresno County
Granville Hutton, Farm Advisor, San Joaquin County
Milton Miller, Extension Agronomist, Davis
John Underhill, Farm Advisor, San Joaquin County
Marben Waller, Farm Advisor, Fresno County

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. George B. Alcorn, Director, California Agricultural Extension Service.

MARCH 1964-3M Rerun

THE 4-H WEED PROJECT

THE HIGH COST OF WEEDS

Weeds cost California farmers almost $1 million a day! If we add the cost of seed inspection, weed research, eradication, and doctors' bills, the loss would be much higher.

Weeds compete with crop plants for light, nutrients, water, and minerals. This competition with weeds reduces crop yields and even may destroy entire plantings.

Weeds increase the cost of labor and equipment, since we must control the weeds to grow crops. Highway departments and railroad companies spend a great deal of money to control weeds along rights-of-way to reduce fire hazard.

Weeds reduce the value of many farm products. Seed crops with weed seeds in them are less valuable. Pieces of green weeds in threshed grain can cause it to spoil. Weeds in hay may make if unpalatable to animals and lower its feed value. If weeds such as wild garlic and ragweed are eaten by cows, the milk may have an undesirable flavor. Weed seeds may become entangled in the wool of sheep. Weedy grasses may stain cotton that is machine harvested.

Weeds harbor insects and diseases that invade croplands. Curly top of sugar beets is one of the virus diseases spread from weeds to crop plants by leafhoppers. Jimson weed is a home of red spiders, cotton aphids, potato flea beetles, and other damaging insects.

Weeds cause land value to depreciate. A farmer cannot borrow as much money on land that is badly infested with weeds because the yields will be low and the cost of reclaiming the land is high. Animals may get sick or die from eating poison weeds. Many people are made uncomfortable each year by poison oak, poison ivy, or sumac. The pollen of weedy plants is the cause of many cases of hay fever. Weeds are a nuisance in flower beds and lawns, and along roadways.

This project has two parts. In the first part you will collect, identify, and mount weed plant specimens. In the second part you will learn ways to control weeds in your garden, lawn, or on your farm.

COLLECTING AND IDENTIFYING WEEDS

EQUIPMENT YOU WILL NEED

For Collecting Plant Specimens

A container for fresh specimens. A damp cotton or burlap bag makes an excellent container for specimens until they can be pressed. Some collectors place their plants between newspapers or in a plant press. A metal lunchpail with damp newspaper or cloth in it makes a handy field case for small plants.

For Pressing and Drying Plant Specimens

A plant press for collecting, preserving, and mounting plants.

For Mounting Specimens

Mounting cards 11½ by 16½ inches (herbarium type or light cardboard).

For Display and Storage (optional)

- □ Window envelopes to protect your mounted specimens and for display. A 12- by 17¼-inch envelope with a 10- by 14-inch cellophane window is a good size.
- □ Riker specimen mounts (frequently used to display insect collections).
- □ Cellophane or polyethylene bags to display weed and crop seeds.
- □ Storage boxes, such as cardboard boxes, airtight wooden or metal boxes, file cabinets, or large airtight cabinets.
- □ Other materials, such as clear plastic, saran wrap, acetate sheeting, glass jars and vials, to protect and display plants or plant parts. You can use large manila envelopes as handy covers, or plastic-covered specimen sheets in a large looseleaf binder.

COLLECTING PLANT SPECIMENS

The weed plants you collect should be complete. The flower is the part of the plant best used for identification. If possible, include roots, leaves, fruits, and seeds. Collect the entire plant of moderate-sized plants (18 to 24 inches), including a flower or fruit. From larger plants, collect and mount a flowering portion, and add stems and leaves from the lower part.

Collect flowers and leaf-bearing twigs from shrubs. Collect complete specimens of grasses and legumes. Grasses are difficult to identify without flowers or seedheads. Place specimens in a damp container until you can properly dry and press them.

DRYING AND PRESSING YOUR SPECIMENS

Cardboard Plant Press

This press is easy to make and costs nothing. Use corrugated cardboard from large cardboard cartons, such as those you can get from any grocery store. Cut out four pieces of cardboard (12 by 18 inches). You will need three or four large rubberbands, which you can cut from old inner tubes.

Make sure each plant is properly labeled, and then place it flat between several thicknesses of folded newspaper, or between two blotters. You can cut blotters from building felt paper which you can buy from lumberyards. It comes in rolls 12 inches wide. Make your blotters 11½ by 16½ inches.

After you have protected your plant with newspapers or blotters, place it between the corrugated cardboard. Repeat until the press is full. This press will hold three specimens. Stretch rubberbands around the press, leaving equal spaces between them. Place a board (1 by 12 by 14 inches) over the press. Place bricks or bags of sand on top of the board to help flatten the specimens and distribute the pressure evenly over the whole press.

Wooden Plant Press

If you have had any experience in making things with tools, you will find it easy to make wooden frames for the top and bottom of your plant press. Use wood laths or wooden strips about the size of laths (¼ by 1½ inches). Smooth the laths, and cut ten pieces 12 inches long, and four pieces 18 inches long. Put them together as shown in the drawing. Use small nails or small ½-inch roundhead screw s. You can use a hand drill to make the holes for the screws or nails, to prevent the laths from splitting.

Use these wooden frames on your cardboard press in place of the board and weights. You can use large rubberbands or leather straps to hold the press together tightly. Rapid drying will give you a better quality of specimens. You can speed up the drying by changing the blotters or newspapers each day.

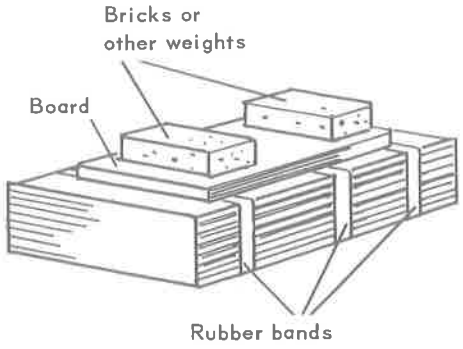


Figure 1. Cardboard Plant Press.

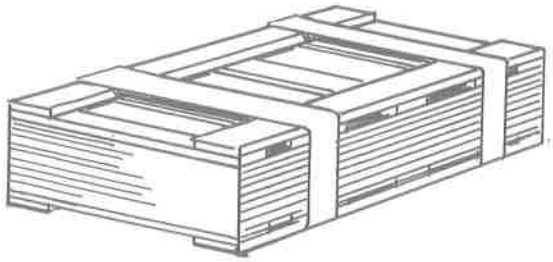


Figure 2. Wooden Plant Press.

IDENTIFYING YOUR PLANT SPECIMENS

Now that you have collected your plant specimens, how will you identify them? Perhaps your club leader, your parents, farm advisor, or neighbor can help you. Or, you might try to match your plants to pictures in a book on weeds. But the best way is to use a systematic, orderly method of plant identification known as a **plant key.**

Every plant has a scientific name. Most plants also have a common name. Some plants have many common names. For instance, black mustard is called khardal aswad in Arabia, moutarde noire in France, senfkohl in Germany, mostarda in Italy, and kara hardal in Turkey. In English-speaking countries this weed has several names—cadlock, warlock, scurvy, senvil, brown mustard, Kerlock, and scurvy-senvil.

You can see how confusing it would become if everyone used his own name for a plant. By using a scientific name, you can be sure you are thinking of the same plant no matter where you live. The scientific name of this plant is **Brassica nigra.** The first part identifies the genus and the second part is the species. (The plural of species also is species.) The basic method of classifying plants breaks them down into class, subclass, order, family, genus, species, and variety. The following breakdown of cultivated barley and alfalfa may help you to understand this system of classification.

	Barley	Alfalfa
Class	Angiospermae	Angiospermae
Subclass	Monocotyledonae	Dicotyledonae
Order	Graminalis	Rosales
Family	Graminae	Leguminosae
Genus	Hordeum	Medicago
Species	vulgare	sativa
Agricultural variety	Atlas	California common

PLANT KEYS

Plant keys help you to identify plants by a system of elimination. First, you determine the family to which the plant belongs, such as the grass, pea, or composite family. Then you determine the genus, such as brome in the grass family, lupine in the pea family, or thistle in the composite family. Finally, you determine the species, such as ripgut, grassland lupine, or yellow star thistle. You will be able to do this much more quickly when you have learned to recognize the families and genera (plural of genus).

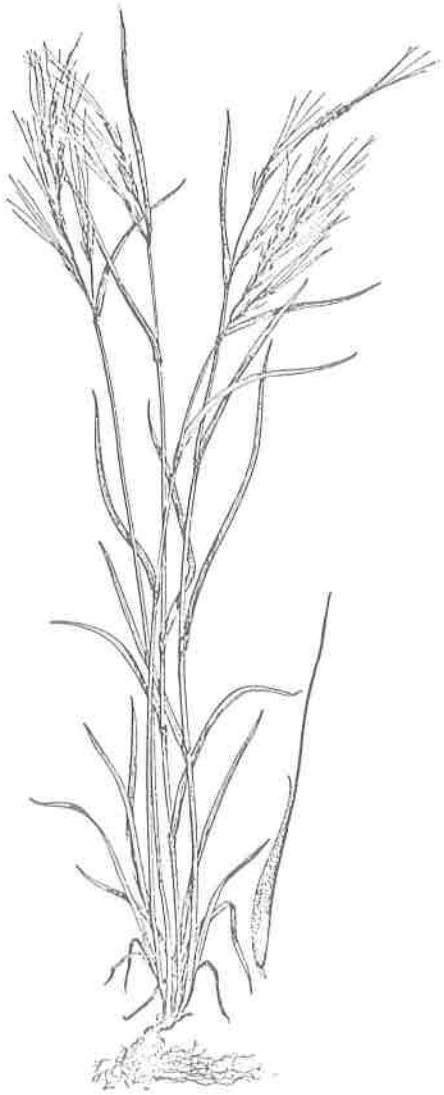


Figure 3. Ripgut (*Bromus rigidus*).

Figure 4. Lupine (*Lupinus* species).

Figure 5. Yellow star thistle (*Centaurea solstitialis*).

Plant Parts

All parts of a plant are used for identifying them and keying them out, but the flowers and the seeds are the most important parts. Flowers of the same kind of plants do not vary as much under different soil, moisture, and temperature conditions as the other parts of the plants do. You can recognize the relationship between plants by their flowers, even though they may have different growth habits. Most of you can recognize a member of the pea family by its flowers, even though you have seen many different growth types in this family. For example, clovers, alfalfa, lupine, locust trees. To help you use the plant key to identify plants, you will need to know the parts of a plant. Study this list of plant parts and compare them with figures 6, 7, and 8.

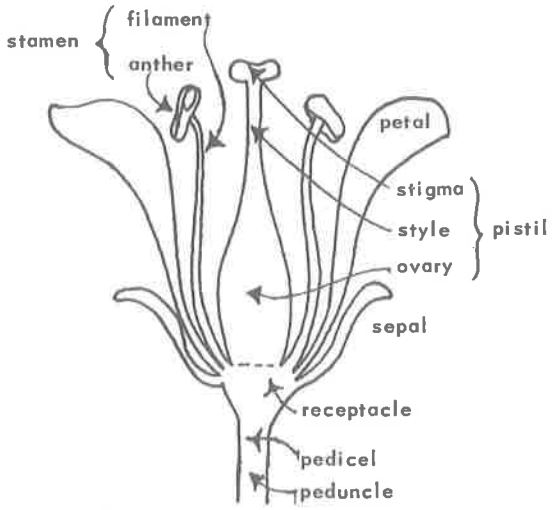
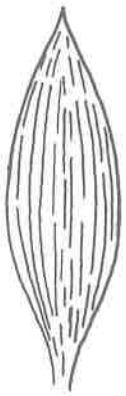


Figure 6. Flower parts.

Figure 7. Irregular flower.

Anther	Pollen-bearing part of the stamen.
Calyx	Outer series of floral parts – all the sepals as a unit.
Corolla	All the petals as a unit.
Filament	Stalk or stem of the stamen.
Pedicel	Stem of an individual flower in a cluster.
Peduncle	Stem of a single flower or of a flower cluster.
Petal	One section of the corolla or inner floral parts.
Ovary	Seed-bearing organ, seedpod or ball.
Pistil	The part of the flower where seed forms – contains the stigma, style, and ovary.
Receptacle	Enlarged end of flower stalk on which the flower parts are borne.
Regular flower	A flower with parts equal in size and shape (especially the petals).
Sepal	One section of the calyx or outer floral parts.
Stamen	Male floral organ which bears the pollen (includes filament and anther).
Stigma	Tip of the pistil.
Style	Stem of pistil (connects the stigma and ovary).
Irregular flower	A flower with parts unequal in size and shape (especially petals and/or sepals).
Leaf blade	Broad portion, not including leaf stem (petiole).
Netted veins	Veins in leaf form a net and are not parallel.
Parallel veins	Veins in leaf in parallel arrangement, not netted.
Petiole	Stem of leaf.

netted veined leaf



parallel veined leaf

Figure 8.

Using the Plant Key

The first step in identifying a weed specimen is to use the key to determine the family to which it belongs. (We will not consider the class or order in our identification.) Using the key in **Weeds of California**, pages 26–29, we will key out black mustard as an example. Look at the picture of black mustard and note how we identify the plant by the process of elimination.

I. Nonflowering plants – does not apply because mustard has flowers; move to II.
II. Flowering plants.
  A. Leaves with parallel veins – does not apply; move to B.
  B. Leaves with netted veins and with parts of flowers (sepals and petals) in groups of 4's and 5's.
    1. Corolla, none; calyx present or absent – does not apply because mustard has petals (see definition of corolla).
    2. Corolla and calyx present; petals distinct or nearly so.
      Ovary superior (free from calyx)
      Stamens attached to receptacle, 10 or fewer.
        Pistil, more than 1 – does not apply; move on.
        Pistil, 1; styles or stigma 1 or more.
      Flowers irregular – does not apply; move on.
      Flowers regular.
        Flowers cruciferous (4 sepals, 4 petals in the shape of a cross)
          6 stamens (4 long, 2 short)

We have now identified our sample as a member of the mustard (**Cruciferae**) family.

The second step is to determine the genus of our plant within the mustard family. (See the plant key on page 204 of **Weeds of California**.)

Pods flattened contrary to narrow partition – does not apply.
Pods not flattened contrary to narrow partition.
  Pods elongated, several times longer than wide.
    Pods breaking transversely into 1-seeded joints – does not apply.
    Pods not breaking transversely into 1-seeded joints, dehiscent (breaking open) by halves.
      Petals usually with a narrow limb – does not apply.
      Petals usually with a broad limb.
        Pods with a long, distinct beak – **Brassica**.

We have now identified our sample as belonging to the **Brassica** genus within the mustard family.

The third step is to determine the species of the genus **Brassica**. (See the plant key on page 207 of **Weeds of California**.)

Pods ascending, 1 inch or more long, not closely appressed (lying flat against) to the stem – does not apply.
Pods commonly 1 inch long or less, strongly appressed to stem.
Stems smooth or nearly so.
Beak weak and short, pods somewhat square – **Brassica nigra.**

We have now determined the species, **nigra**, and know our plant is **Brassica nigra**, black mustard, in the mustard family.

Figure 9. Black mustard (*Brassica nigra*).

MOUNTING PLANT SPECIMENS

After your specimens are dried and identified, remove them from the newspaper and mount them.

Mounting cards may be the University of California all-rag, permanent herbarium type; but white heavy paper or light cardboard is satisfactory and less expensive. Fasten your specimens to the mount cards with scotch tape, adhesive cloth, gummed cloth, or one of the new long-lasting nonshrinking tapes.

Another method, frequently used in herbariums, makes a neater and more permanent display. A good grade of wet paste is spread evenly on a sheet of glass. The plant is placed on the glass for a moment and then transferred to the herbarium mount card. Strips of gummed cloth are used to fasten the specimens to the card more securely. Flower clusters containing seeds, especially those with very small seeds, can be covered with strips of cellophane tape to prevent their shattering.

Forceps are helpful in handling small dried specimens.

Riker mounts can be made or bought at biological supply houses. These are flat boxes (about 2 inches high) with glass windows in the lids. The specimen is placed on a soft, absorbent material, such as cotton, which fills out the space below the specimen. These mounts are available in different sizes to fit the sample to be displayed.

LABELING YOUR PLANT SPECIMENS

Each plant you add to your collection must be labeled properly. Write the information on a 3- by 5-inch card. You can take some of this information from the notes you made at the time of collection. This information also can be typed on the mounting sheets before mounting the plants.

For convenience, arrange your collection in a definite order. The order of **Weeds of California** is an easy one to use.

4-H WEED PROJECT (EXAMPLE)

Black mustard – Brassica nigra

Found in irrigated barley field 5 miles east of Stockton on Farmington Road, San Joaquin County, California

Common in grain fields of United States

Control with 2,4-D amine when crop is well established and tillered. (Do not spray in boot stage.)

John Jones May 8, 1963

DISPLAYING YOUR PLANT SPECIMENS

Window envelopes are best for displaying mounted plants. You may want to use 12- by 17¼-inch envelopes with 10- by 14-inch cellophane windows. These can be made or purchased from paper companies or biological supply houses.

Riker specimen mounts frequently are used to display insect collections.

Cellophane or polyethylene bags can be used to display weed and crop seeds.

STORING YOUR PLANT SPECIMENS

You must protect your specimens from insects that frequently eat dried plants. Cardboard or wooden boxes may be used to store your plant collection. As a further protection, use mothballs or other insect repellents, such as a mixture of ethylene dichloride and carbontetrachloride.

WEED CONTROL

You have learned something about weeds – how they look and how they grow. You also will want to know how to control them, so that they will not cost us so much money and discomfort.

HOW WEEDS ARE SPREAD

Weeds are spread by wind, water, animals, and man.

Man probably has caused the widest distribution. He transports his crops great distances, and weeds frequently are included. Many weeds were brought into California from Europe and Asia in imported seeds, rootstocks, and in the ballasts of ships. Weeds are moved by man in feed, packing around trees, construction dirt, on wheels of cars and airplanes, and on many farm machines and implements.

Plants are spread by vegetative means as well as by seeds. Some perennial plants spread by rhizomes (underground stems) and stolons (runners). These plant parts often are spread from one part of a field to another, or even to another field, by farm machinery or in soil that is moved.

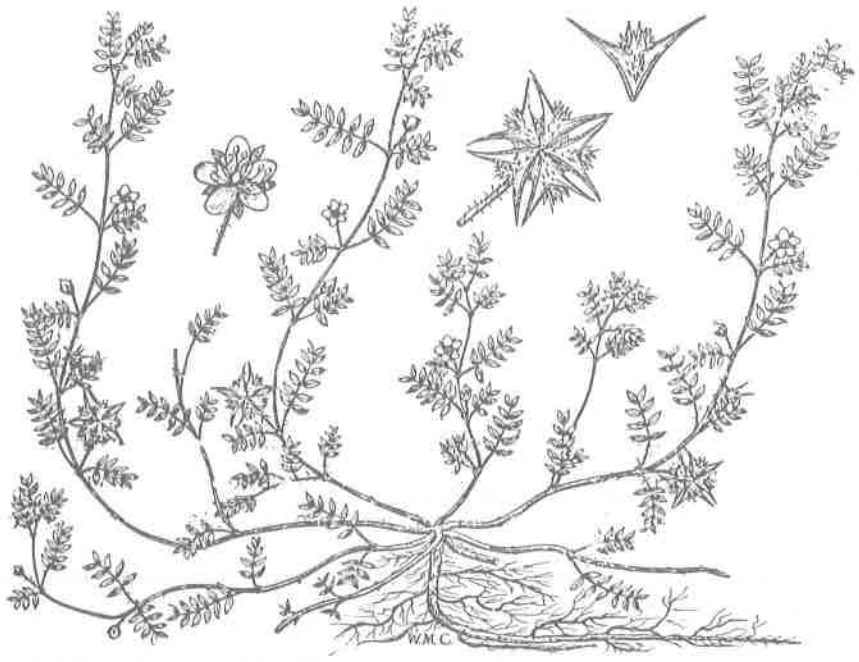


Figure 10. Puncture vine (*Tribulus terrestris*).

Figure 11. Bermuda grass (*Cynodon dactylon*).

Wind spreads many seeds, especially those that are "airborne." Some seeds have wings, such as the fruit of the tree-of-heaven; some have long, silky hairs, such as milkweed or cattails; some have parachute fruits, such as the thistles and dandelions. Others scatter their seeds as the wind blows them across the fields, such as the tumbleweeds.

Water, especially irrigation water, spreads many weeds. Some weed seeds have wings, air pockets, or cork tips that enable them to float. Many seeds remain viable (capable of growing) in the water and mud for long periods of time. Roots and stems carried by water may start to grow farther downstream.

Animals spread seeds when the stickers or barbs that hold the fruit cling to their hairy coats or their feet. Many seeds can go through the stomachs of animals and birds without being destroyed, and are spread with the droppings. Some seeds seem to grow even better after they have passed through an animal.

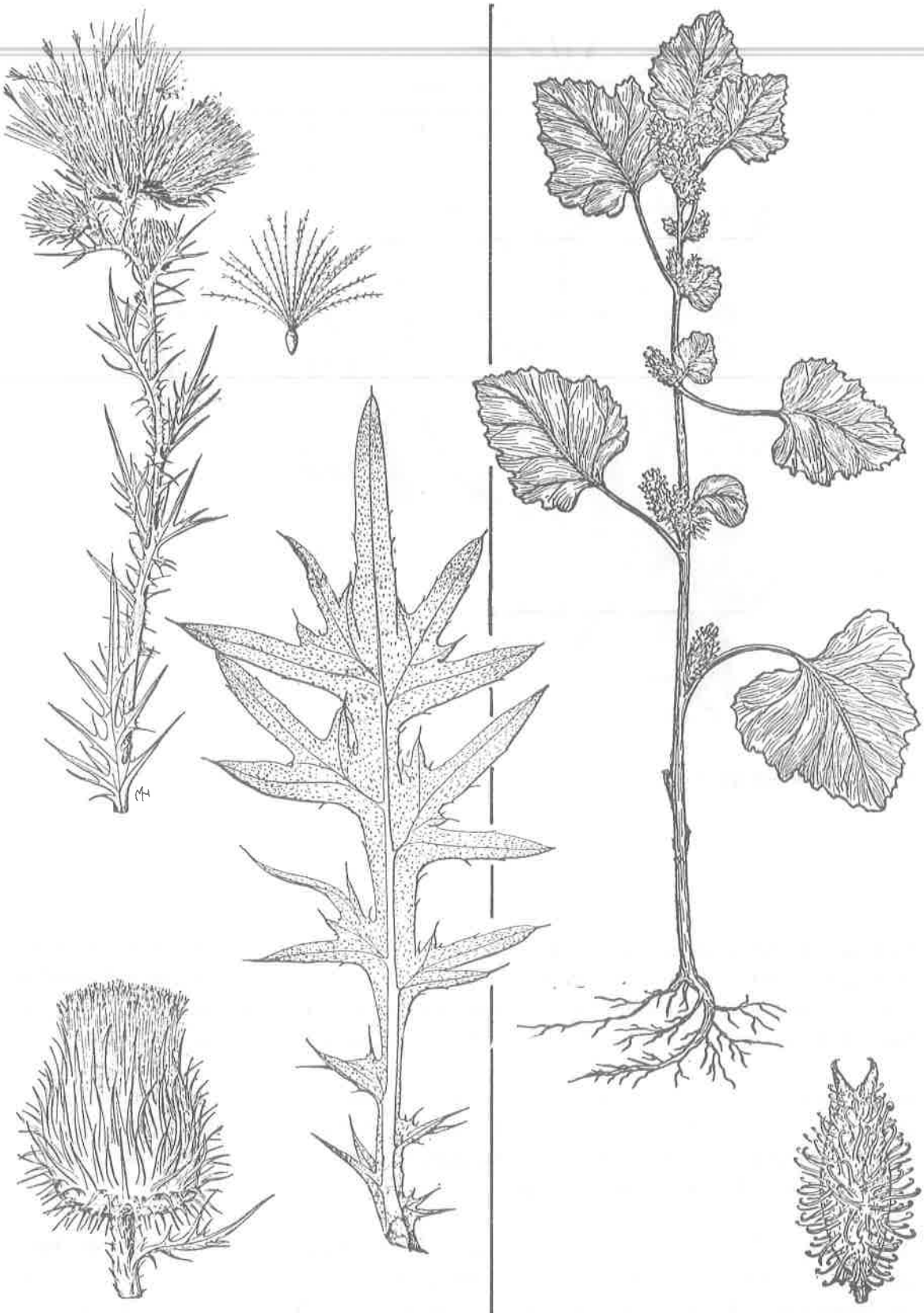


Figure 12. Bull thistle (*Cirsium lanceolatum*).

Figure 13. Cocklebur (*Xanthium canadense*).

NOXIOUS WEEDS

The California Agricultural Code defines a noxious weed as "any species of plant which is or is liable to be detrimental or destructive and difficult to control or eradicate." Noxious weeds are further classified as primary and secondary. The Director of Agriculture may add other weeds to the list if they become a serious threat and need to be controlled.

Primary noxious weeds are described as "such noxious weeds that not only reproduce by seeds but also spread by underground roots or stems, and which, when established, are highly destructive and difficult to control in this State by ordinary good cultural practice."

Primary Noxious Weeds (March 1962)

Austrian fieldcress	*Rorippa austriaca*
Blueweed	*Helianthus ciliaris*
Camel thorn	*Alhagi camelorum*
Canada thistle	*Cirsium arvense*
Horsenettle	*Solanum carolinense & S. elaeagnifolium*
Leafy spurge	*Euphorbia esula*
Perennial gaura	*Gaura coccinea, G. odorata, G. sinuata*
Perennial peppercress	*Lepidium latifolium*
Perennial sow thistle	*Sonchus arvensis*
Quackgrass	*Agropyron repens*
Russian knapweed	*Centaurea repens*
Whitetop or hoary cress	*Cardaria pubescens and C. draba*

Secondary noxious weeds are described by the code as "all species of noxious weeds not classified as primary noxious weeds."

Secondary Noxious Weeds (March 1962)

Alkali mallow	*Sida hederacea*
Bermudagrass	*Cynodon dactylon*
Dodder	*Cuscuta* species
Halogeton	*Halogeton glomeratus*
Italian thistle	*Corduus pycnocephalus* and *C. tenuiflorus*
Johnsongrass	*Sorghum halepense* and other perennial sorghum species, including but not limited to sorghum alum and perennial sweet sudangrass
Klamath weed	*Hypericum perforatum*
Mediterranean sage	*Salvia aethiopis*
Nutgrass – yellow and purple	*Cyperus esculentus* and *C. rotundus*
Poverty weed	*Iva axillaris*
Puncture vine	*Tribulus terrestris*
Sandbur grass	*Cenchrus pauciflorus*
Wild morning glory	*Convolvulus arvensis*
Yellow star thistle	*Centaurea solstitialis*

Prevention

The simplest way to control weeds is to prevent their spreading. Federal and state inspectors work hard to protect the farmer, but he also must do his part. Here are some of the things the farmer can do to help prevent the spread of weeds.

- □ Use clean seed. (Certified seed is inspected for weed seeds.)
- □ Be sure that animals he brings in do not have weed seeds on coats or feet.
- □ Do not feed screenings, grain, or hay containing weed seeds unless their viability has been destroyed by grinding, cooking, or ensiling.
- □ Do not use animal manure unless seed viability is destroyed by fermentation.
- □ Clean all equipment before moving it from infested areas.
- □ Inspect nursery stock for weed seeds, rhizomes, and tubers of perennial weeds. Purchase only inspected stock.
- □ Keep irrigation ditchbanks free of weeds.
- □ Keep fence lines, roadsides, and other uncropped areas free of weeds.
- □ Prevent weeds in fields from going to seed. (One plant may produce several million seeds.)

It is not possible to keep all weeds out of a field, no matter how hard you may try. Many weeds already are in the fields, and many weed seeds will come in by air, on animals, or in irrigation water, in spite of all care. These weeds must be controlled by some means. Preventive weed control requires that you remove plants from such places as barnyards, fence rows, ditches, and roadways.

Mechanical Control

Weeds are most commonly controlled by mechanical means, such as plowing, discing, harrowing, cultivating, hoeing, mowing, smothering, flooding, and hand pulling. These methods may kill the plants, retard their growth, kill seeds, or just prevent the production of seed. The method used will depend on the type of seed and the stage of growth when the control is used.

Chemical Control

Chemicals of various kinds are used to control weeds. Some of these, such as salt and smelter wastes, have been used for a long time. The first real step toward the use of chemical herbicides was made when it was noticed that copper salts would kill broadleaved weeds in grain. Since then, many chemicals have been used to make weed control easier and less time consuming. New chemicals are being developed all the time. Some are used as general weed killers or soil sterilants, while others destroy only certain weeds or groups of weeds.

★ ★ ★ CLASSIFICATION OF HERBICIDES ★ ★ ★

Selective herbicides are chemicals used to remove certain weeds from certain crops. They are selective because of the way they are used. Selectivity is not absolute; it may depend on the amount of herbicide applied, the degree of wetting of the foliage, the amount of rainfall following application, the tolerance of different plants to a specific herbicide, and differences in age, size, and growth habits of crop and weed. Because selectivity can depend on all of these things, the same herbicide may be either selective or nonselective, depending on how it is used.

Foliar translocated herbicides move within the plant, and may be effective in destroying roots of perennial plants. Selectivity depends namely on difference among plants. (Example, 2,4-D.)

Soil-active herbicides may be used before the crop emerges from the soil (pre-emergence), or after the crop emerges (post-emergence). The weeds may or may not have emerged, depending on the herbicide and how it is used. If these herbicides are to be effective, surface moisture must follow their application. Best results are obtained when these herbicides are carried into the soil by rainfall, overhead irrigation, or a subirrigation that thoroughly wets the treated area. Selectivity depends upon plant tolerance, location of herbicide in the soil, and difference in growth habit of crop and weed.
Example: EPTC (Eptam).

Nonselective herbicides are used to remove a wide range of vegetation, although plants may differ in their susceptibility to any specific herbicide. We use these where we do not intend to be selective.

Foliar contact herbicides kill only the plants or portions of the plants actually contacted by the herbicide. To be effective the vegetation must be covered thoroughly with a solution strong enough to kill it. Annual weeds usually are killed by one thorough treatment. Perennial weeds require retreatment. (Example: Fortified oils.)

There are very few foliar-applied **nonselective translocated herbicides.** Although they affect a wide range of plants, there is as yet no truly nonselective translocated herbicide. Retreatment usually is necessary when treating perennial weeds.
(Example: Amitrol.)

There are many **nonselective soil-applied herbicides** that are classified as soil fumigants and soil sterilants. These are used where you wish to remove all plant growth, or to keep areas free of all plant growth. Any plant in the treated area may be affected.

Soil fumigants most often are used to kill all plant growth before planting a desirable species. They usually are used as a vapor or gas which spreads through the soil. Since they have a short life in the soil, the treated area may be replanted within a month or less. (Example: Methyl bromide.)

Soil sterilants are used where it is desired to prevent all plant growth for periods varying from months to years. The length of time the soil remains sterile will depend on the herbicide used, the amount applied, rainfall, soil type, and composition. (Example: Mixtures of borates and chlorates.)

A few herbicides may be used for the control of submerged aquatic weeds. These are dissolved in the water in canals, ditches, ponds, and lakes. They are mostly non-selective, although a few species may be resistant to the herbicide used. (Example: Copper sulfate.)

Always read the label on the herbicide package. Follow instructions.

Note that some herbicides are dangerous to use and require a permit from the County Agricultural Commissioner.

Biological Control

Under normal conditions, the natural enemies of a plant help to keep it under control. If these conditions change, or if the plant is moved to a new environment, the natural enemies may not be present. The plant could then multiply until it became a serious weed. For example, prickly pear was brought into Australia before 1839. By 1925, an area as large as Oregon had become uninhabitable, and the cactus was spreading at the rate of 1 million acres each year. In 1926, the mothborer Cactoblastic cactorum was turned loose in the area. Ten years later, nearly all of the cactus infestation had been destroyed by this insect.

In California, Klamath weed, or St. Johnswort, was controlled by the Klamath weed beetle, which lives on nothing but this undesirable weed. Before a weed is biologically controlled, the "cure" must be thoroughly tested to make sure that the insect does not become a pest.

DEMONSTRATIONS

Demonstrations are an important part of the 4-H Club program. They give club members an opportunity to show what they have learned in their project work. Since most 4-H members and parents do some work with plants, these demonstrations should be of interest to many.

You are expected to give at least one demonstration a year, in which you discuss something related to this project. Following are some suggested topics:

- ☐ How To Make a Plant Press
- ☐ How To Use a Plant Press
- ☐ How To Mount Pressed Plants
- ☐ Steps Taken To Key Out Plants
- ☐ Parts of a Plant
- ☐ How Weeds Cause Losses
- ☐ Importance of Growth Habit to Weed Control
- ☐ Methods of Weed Control
- ☐ Action of Weed Control Chemicals
- ☐ Methods of Applying Herbicides
- ☐ Weed Control in Orchards
- ☐ Differences in Controlling Annual and Perennial Weeds
- ☐ Weed Control Districts
- ☐ Plan for Irradicating Perennial Noxious Weeds
- ☐ Weeds in Grain Fields
- ☐ Weeds in Summer Row Crops
- ☐ Weeds in Rice
- ☐ Calibrating Spray Equipment
- ☐ Herbicide Applicators

For methods of giving a demonstration, see the bulletin, **The Know-How of 4-H Demonstrations.**

REFERENCES

The following publications will help you in keying out plants. They also contain information on weed control.

1. **Weeds of California.** W. W. Robbins, et al. Printing Division, Documents Section, Sacramento. This well-illustrated book includes a discussion on the principles of weed control, a key of weeds common in California, and descriptions of these plants and their distributions.

2. **How to Know the Weeds.** H. E. Jaques. W. C. Brown Company, Dubuque, Iowa. A book with many pictures in the key and well-illustrated descriptions of plant parts and terminology.

3. **A Laboratory Manual of Range Plants.** Beecher Crampton. Department of Agronomy, University of California, Davis. A good key for range plants.

4. **Weed Control.** W. W. Robbins, et al. McGraw-Hill Book Company, 1952. A college textbook that fully treats many different weed-control methods.

5. **Weed, Grass, and Brush Control Handbook.** Dow Chemical Company, Midland, Michigan. Includes a practical description of weed-control methods, sprayer adjusting conversion tables, and list of common and scientific names of many weeds.

6. **Illustrated Flora of the Pacific States.** Leroy Abrams. Stanford University Press, 4 volumes.

7. **Arizona Ranch, Farm and Garden Weeds.** Agricultural Extension Service Circular 265. University of Arizona, Tucson. A very good, well-illustrated weed manual.

8. **Weed Seed Handbook.** Margaret K. Bellue. California State Department of Agriculture, Special Publication 275. Revised.

9. **Livestock-Poisoning Weeds of Oregon.** Helen M. Gilkey. Agricultural Experiment Station Bulletin 564. Oregon State College. 1958.

10. **Weeds of the Pacific Northwest.** Helen M. Gilkey. Oregon State College. 1957.

USDA publications about weeds and weed control (available through your farm advisor's office).

1. **16 Plants Poisonous to Livestock in the Western States.** Farmers Bulletin 2106.

2. **Using 2,4-D Safely.** Farmers Bulletin 2005.

3. **Johnson Grass as a Weed.** Farmers Bulletin 1537.

4. **Field Bindweed and Its Control.** Leaflet 496.

University of California publications on weeds and weed control (available at your farm advisor's office).

1. **Control of Weedy Grasses Around the Home.** Agricultural Extension Service Publication AXT–27.

2. **Principles of Selective Weed Control.** California Agricultural Experiment Station Circular 505. 1961.

3. **Poisonous Plants in the Garden.** Agricultural Extension Service Publication AXT–22. 1960.

4. **Improvement of Medusahead-infested Rangeland.** Major, McKell and Berry. California Agricultural Experiment Station Leaflet 123. 1960.

Here's how U C A E S helps your 4-H program

The Agricultural Extension Service of the University of California and the United States Department of Agriculture serve and assist 4-H Club members, their parents and leaders with professional guidance, training, and literature.

The University of California is represented in your county by farm and home advisors, one or more of whom are responsible for 4-H Club work. They bring the latest information on agriculture and home economics to you and your family. The Agricultural Extension Service prepares and distributes publications, such as this one, to help you in your 4-H work, and to help make 4-H Club work in California a success.

4-H

LEADERS GUIDE

PLANT SCIENCE TEACHING OUTLINE

FOR PROJECT MEETINGS

Prepared by the 4-H Plant Science Project
Development Committee:

Tom Byrne, Farm Advisor - Alameda
Ray Copeland, formerly Farm Advisor - Tulare
Wayne Morgan, former Farm Advisor - Los Angeles
John Prato, Extension Agronomist - Davis
Ros Roberts, Farm Advisor - Inyo-Mono
Robert Sheesley, Farm Advisor - Fresno
Don Thrift, former Farm Advisor - Santa Clara
Allen Wilson, formerly Farm Advisor - Santa Cruz
A. D. Aulenbacher, 4-H Specialist - Riverside
Harry L. Miller, 4-H Specialist - Davis

Cooperative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating.

3/68-1000 Rerun

INTRODUCTION

This teaching outline has been prepared to assist the 4-H club plant science project leader to organize a series of project meetings for members. The topics listed will serve as a basis for selection of teaching units to be taught at group meetings. The beginning units are designed to give the member an introduction to the fundamental "whys" of growing plants. These units will prepare the member to start a project program in growing vegetables, field and row crops, and ornamental horticulture.

The intermediate units will guide the leader in assisting the member to learn information which will result in more effective project work. The advanced phases can help the member to explore the scientific aspects of plant production and career opportunities related to plant science projects.

The importance of vegetable, crop and fruit production on California farms provides many valuable opportunities for 4-H members to enlarge their project experience. A field trip or visit to a project or a growing crop is an ideal laboratory to teach a basic practice, skill or principle related to the interests of the group.

The leader will want to consider the members projects in selecting the unit to be taught to the group. Each member will carry a home project. Selection can be made from the projects listed in the 4-H Plant Science Outline. Beginning members may grow 150 sq. ft. of a single vegetable, flowers or beginning crop units. Project size increases with experience. The member will need assistance in selecting a suitable project which meets his interest, home situation and relates to the items being taught. He will need instruction on keeping records and assistance with demonstrations. Instruction on selection, planning and care of the project is to be given at project meetings by the leader.

The beginning unit of study is recommended for the first year. The leader at the intermediate stage may wish to select subjects from more than one teaching unit for the years program. The following year additional topics will be studied. The member during a three or four year period will have an exposure to the major learning areas in plant production. The program also provides an opportunity for the advanced member to engage in projects with greater depth and selected learning experiences from the teaching outline which relate to his interest.

The leader can help the member in the 4-H Plant Science project to increase each year his knowledge and skill through an effective group teaching program to supplement the project experiences.

In planning a years program the leader will each year -

1. Teach and assist members to select and plan suitable projects which fit their interests and home situation.
2. Teach members to keep adequate records of their projects.
3. Assist members to develop demonstrations related to their projects.

In addition the beginning unit 1 or 1A will be taught by the leader and junior leader the first year. The group can study the second unit the following year and then select suitable topics which supplement the three items above for succeeding years.

Approximately 8 meetings will be needed to complete a project year.

The following meeting outline can serve as a guide to the leader in conducting each project meeting:

1. Meeting called to order by group chairman (a member appointed or elected by the group).

2. Pledge to Flag and 4-H Pledge.
3. Announcements, reports and group planning.
4. Project guidance in the selection, planning, culture, records and demonstrations related to members projects.
5. Instruction period.

The leader and Junior Leader will teach the lessons included in the plant science unit being studied by the group.

BEGINNING UNITS

I. 4-H BASIC PLANT MANUAL

Introduction to Seeds (Select this unit or I-A)

LEARN:

Exercise 1. What is inside the seed.
Exercise 2. Cotyledons and what they do.
Exercise 3. How corn germinates.
Exercise 4. Methods of germinating seeds.
Exercise 5. Changes which occur in germination.
Exercise 6. Strength of seeds in germinating.
Exercise 7. Oxygen requirements of seeds.
Exercise 8. Old vs. new seed.
Exercise 9. Purpose of Cotyledons.
Exercise 10. How soil types effect germination.
Exercise 11. Effect of fertilizer on plant growth.

Project Guidance:
Selection, planning, culture, records and demonstrations.

I-A SEEDS (Alternate Beginning Unit)

LEARN:

1. The nature of seeds
2. What is inside seeds
3. What makes seeds grow
4. Supplying food for seeds
5. The function of roots and stems
6. Working with other kinds of seeds

Project Guidance:

Same as Unit I.

II. AN INTRODUCTION TO PLANT SCIENCE

LEARN:

1. Starting the Project
2. Key terms for plant science
3. Getting acquainted with plants, their uses and enemies
4. The parts of plants and their enemies
5. How the plant grows, factors which influence growth
6. Starting your crop project
7. Displaying and judging plant science projects

Project Guidance:

Same as Unit I

Projects for beginning members should be limited to gardens, flower gardens and beginning units in crop projects.

INTERMEDIATE UNITS

I. CULTURAL PRACTICES

LEARN:

1. Planning your project
2. Land preparation
3. Planting the crop
4. Care of the crop
5. Harvesting for quality
6. Marketing processing and storage
7. Post harvest

Project Guidance:

II. SOILS AND IRRIGATION

LEARN:

1. How soils are formed
2. Characteristics of sand, silt, clay
3. General chemical nature of soils
   a) soil salinity
   b) alkali soil
   c) base exchange
4. The living soil (microbiology of soils)
5. Soil compaction
6. When to irrigate
7. Kind of irrigation application system to use
8. Soil and water conservation methods

Project Guidance:

III. FERTILIZATION UNIT

LEARN:

1. Nutrient requirements of plants
2. Methods used in determining nutrient deficiencies
3. Sources of fertilizer (organic and inorganic)
4. Methods of application and placement effectiveness of fertilizers
5. Demands of local crops for nutrients and common practices of supplying these
6. Local deficiencies and excesses in soils

Project Guidance:

IV. INSECT CONTROL UNIT

LEARN:

1. What is an insect
   a) characteristics of insects
   b) parts of an insect
   c) classification of insects
   d) life cycle of insects

2. How insects effect plants
   a) harmful insects and damage
   b) beneficial insects and benefits
3. How to control insects

Project Guidance:

V. FIELD TRIP UNIT
VISIT, OBSERVE AND LEARN, VISIT OR TOUR

1. A nursery
2. A processing or packing plant
3. A soils or plant tissue analysis laboratory
4. A wholesale or retail market
5. A crop harvesting operation in progress
6. A 4-H project tour
7. Attend a crop field day for adults
8. A successful farm

Project Guidance:

ADVANCED UNITS

I. IRRIGATION, SOILS AND PLANT NUTRITION UNIT

LEARN:

1. Major sources of irrigation water
2. Methods of conserving irrigation water
3. How water is measured
4. How water is sold
5. Irrigation districts and their operations
6. Nutrient requirements of plants
7. Sources of fertilizer
8. Methods of determining nutrient deficiencies
9. What happens to separate Nitrogen, Phosphorus and Potassium fertilizers in soil
10. Physical nature of soils - soil formation
    a) major textural classes
    b) relation of soil structure to crops
    c) relation of soil structure to water holding and penetration capacity
11. Nature of soil erosion
12. Soils desirable for local crops

Project Guidance:

II. PLANT PHYSIOLOGY UNIT

LEARN:

1. Parts of a plant and their functions
   a) leaf
   b) root
   c) stem
   d) flower
   e) seed

2. Growth processes - How a plant grows
   a) food transportation and storage processes
   b) propagation of plants (sexually and asexually)
3. Use of insecticides and agricultural chemicals
   a) types of insecticides and uses of chemicals
   b) Hazards of toxicity
4. Plant diseases (bacterial, virus, Fungus)
   a) methods of infection or damage
   b) economical importance
   c) controls available
5. Nematology
   a) general classification in animal kingdom
   b) general types
   c) control methods (cultural, biological, chemical)

Project Guidance:

III. MARKETING IN PLANT INDUSTRIES

EXPLORE:

1. Assembly and storage
2. Transportation
3. Standards and grades
4. Processing
5. Packaging
6. Finance and risk bearing
7. Sales and service
8. Advertising
9. Market information

Project Guidance:

IV. CAREER EXPLORATION IN AGRICULTURE

EXPLORE:

1. Education
2. Communications
3. Research
4. Conservation and Recreation
5. Services
6. Farming and Ranching

Project Guidance:

V. SPECIAL INTEREST PROJECT

ARRANGE - by consulting your Farm Advisor

Examples are:
1. Fertilization trials
2. Advanced management practices
3. Date of planting trials
4. Biological insect control trials
5. Irrigation trials
6. Weed control trials

CULTURAL PRACTICES

4-H PLANT SCIENCE

PROGRAM

LEADERS GUIDE

A TEACHING OUTLINE FOR THE 4-H PLANT SCIENCE

PROJECT LEADER

Cultural Practices Unit

The first two pages of the leaders guide is an outline of the items to be learned by a member, teaching aids supplied for use of the leader and Ideas To Do in teaching at project meetings. An organized instructional program to meet the interest of project members.

The cultural practices unit involves the teaching of several topics related to the culture of vegetable, field and fruit crops. You will select those items which apply to the projects carried by members of your project group. The outline includes material for 8 or more project meetings. The project tour and field trip can be utilized to demonstrate and teach the "whys" of practices in the plant science project program.

Your leaders guide includes worksheet exercises which will supplement your discussions and demonstrations. Single worksheets are available for completion by members at meetings. Answers are provided on one side of the sheet for future reference of the member. The worksheet can stimulate questions from the member for discussion.

You will want to include in your teaching instruction information required by the member to complete his project. This includes project planning, records, demonstrations, exhibiting, and project completion. The plant science leaders teaching outline 4-H Ag 150 has valuable suggestions to help you in organizing project meetings.

Your enthusiasm will make the project year a valuable experience for each member. If you need assistance or additional ideas contact your Farm Advisor. You, as a leader, are performing a vital service in teaching the 4-H member.

Prepared By: Harry L. Miller, 4-H Specialist
Davis

John Prato, Agronomy Technologist
Davis

Don Thrift, Farm Advisor
Santa Clara County

Cooperative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture cooperating.

CULTURAL PRACTICES 4-H PLANT SCIENCE PROJECT

(Intermediate Unit)

LEARN	AIDS TO BE SUPPLIED	IDEAS TO DO
I. Planning the Project Project Plan Site selection and layout Determine equipment needs Cultural requirements Marketing arrangements	Worksheet #1 Planning the Project Map of Project Area 4-H Project Manuals	Guide members in selecting suitable projects. Complete worksheet #1 Demonstrate the needs of growing plants: Assemble a kit to include the following to demonstrate the needs of successful plant production. Air (empty jar) Water (jar of water) Light (light bulb to represent sunlight or warmth) Soil (container) Fertilizer (bag or sample) Equipment (shovel, rake, toy tractor) Time (clock to show importances of proper timing in growing plants).
	California Extension Vegetable and Crop Production Circulars	Site selection: - Demonstrate the effect of shading, use a light bulb on a cord to show shadow cast as the light is passed in an arc across a barrier.
	4-H Crops Project Outline	Marketing - show the need for a market by showing a tied paper bag to illustrate the fact that you can be caught "Holding the Bag".
II. Land Preparation Purpose Equipment Pre-irrigation Crop variation	4-H Project Manuals and California Extension Circulars	Hold field trip to demonstrate soil preparation Observe mechanical soil preparation or show process using hand tools. Have members practice the process.
	4-H Field Crop Program Leaders Idea Manual	Discuss and demonstrate steps in soil preparation. a) incorporate plant residues, cover crops and manure b) control weeds c) prepare land for pre-irrigati d) refine soil structure - make smaller particles

Learn	Aids To Be Supplied	Ideas To Do
		e) seed bed preparation and firming the seed bed to meet the need of each crop. Have members try to plant seed in tilled and untilled soil. Identify tillage equipment either from pictures or a visit to local implement dealer.
III. Planting Planting rate or spacing Planting time, temperature, depth, moisture, & light. Planting equipment Planting stock treatments What part of plant to plant Care of transplants	4-H Vegetable Project Manual. Worksheet #3 Planting Material and Seed Identification Worksheet #4 Seed Identification Mount Seed Germination procedure outline 4-H Plant Propagation Project 4-H Ag-9 4-H Leaders Horticultural Outline	Members complete worksheets 3 & 4 Discuss: Selection of Quality Seed Types of planting materials a) potato - tuber b) gladiola - corm c) sweet potato - root d) daffodil - bulb e) peas - seed f) tomato - seed or transplant g) geranium - cuttings h) bermuda grass - stolons Demonstrate: How to plant, including seed spacing How to Transplant How to make and root cuttings How to plant a tree Use of a hand mechanical planter Pot culture demonstrations: a) effect of planting depth b) temperature - place seeded in the refrigerator. One at room temperature. c) moisture - seeded pot without added moisture d) effect of light - store a plant in the dark. Have each member germinate a sample of seed to be used in his project. Utilize field trips when possible in presenting demonstrations

Learn	Aids To Be Supplied	Ideas To Do
		Observe commercial planting operations and equipment
IV. Care of the Growing Crop Fertilization Irrigation Thinning - Fruit Stems-Limbs Buds Cultivation Pruning & Suckering Pest Control Harvest Kinds of harvest, stems, leaves, fruit & flowers Equipment	4-H Project Manuals and California Extension Circulars 4-H Field Crop Program Leaders Idea Manual Worksheet #5 Identifying Edible Portions of Plants 4-H Judging Manual Cereal & Forage Crops Agronomy Study Kit	Fertilization pot demonstration Leaders Idea Manual Discuss water requirements for plants Field trips or demonstrations a) observe and practice pruning b) thinning fruit c) thinning vegetable crop stands d) insect control methods e) weed control methods cultivation, hoeing or spraying Discuss the purposes of cultivation. a) remove weed competition for soil moisture b) facilitate operations such as irrigation, harvest, brush removal, and spraying c) control certain pests d) aid in water absorption Complete Worksheet #5 Demonstrate: a) stages of product maturity green pre-ripe vine ripe over ripe rotten b) ideal market quality Conduct judging activities
VI. Marketing, Processing and Storage	Field Trip Worksheet #6 Field Trip Worksheet #7	Field trip to processing plant or shed, or grain storage, or commercial company. Worksheet #6 Visit a retail market and report on produce quality and variety to next meeting. Worksheet #7

Learn	Aids To Be Supplied	Ideas To Do
VII. Post Harvest Incorporate crop residue in the soil Prepare for cold weather Storage of vegetative parts Equipment care		Field trip to visit storage facilities Observe rusting of tin cans to demonstrate care of equipment a) unwashed after containing fertilizer b) can with oil film applied Evaluate instructional program with members
VIII. Complete Project Records		Evaluate projects and records with each member.

WORKSHEET #1

MY PLANT SCIENCE PROJECT PLAN AND AGREEMENT

Date_____

Kind of Project_____

Size_____ by_____feet. Square feet_____

When will it start?_____End?_____No. of Months_____

Owner of Land_____ What will I give for use of Land as rent?_____

_____.

Will water be needed for irrigation?_____ Number of irrigations_____

Who will furnish the water?_____cost_____

Equipment that will be needed

Write in any not listed	How obtained - Borrow, rent, hire, or buy	Date Needed	Cost	
Tractor and tillage implements				
Garden Tractor				
Ladder				
Hand tools, hoe, etc.				

Supplies needed: seed, plants, sprays, fertilizers, etc.

Item	When Needed	Total Quantity	Price	Total Cost	

Operations to be done - Land preparation, cultivation, etc.

Job or operation	When Needed	Who will do it	Cost	

How will I sell my crop?_____Where?_____

Anticipated price per bu.?_____ or per ton?_____

Money I will need to complete my project $_____. I have $_____ I can earn and save $_____ Need to borrow $_____.

Daily time needed_____ minutes per day,_____ days

Approval by parent_____.

MAP OF PROJECT AREA

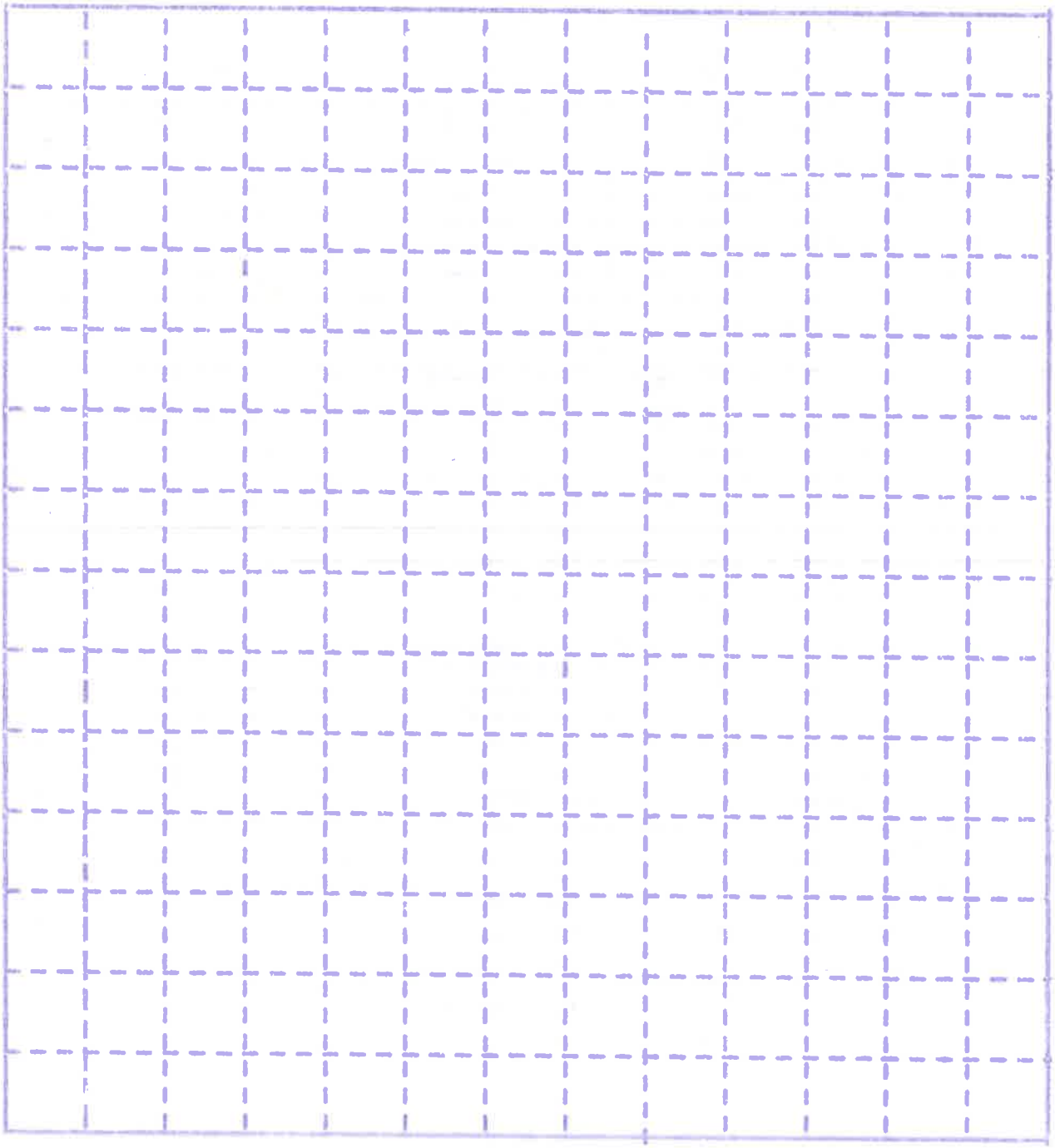
Instructions:

Draw a scale map of your project area to scale using the form below.

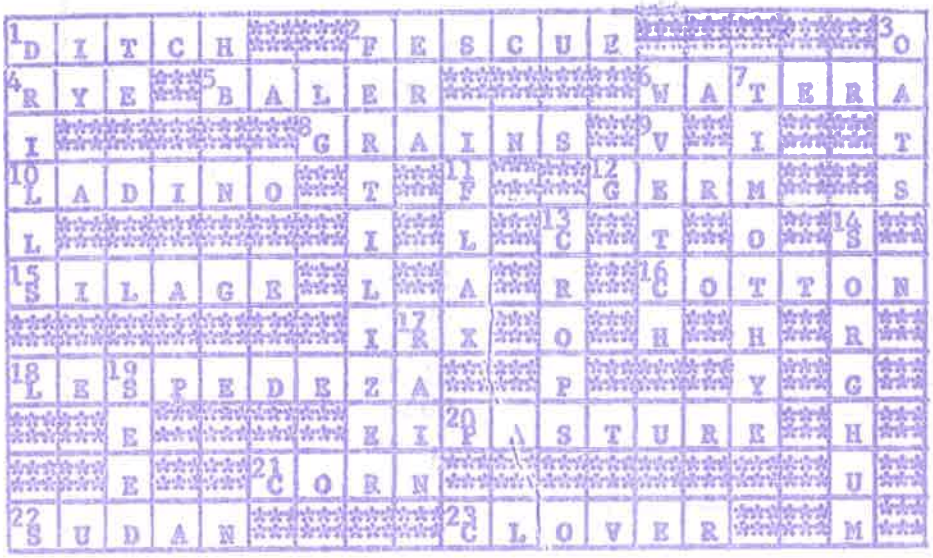
Designate key location points or landmarks which identify the area or boundaries.

Fill in the scale you have used.

Indicate the approximate location on the Farm or Ranch



FIELD CROP PRODUCTION
Crossword Puzzle



ACROSS

1. Carrier of water
2. A pasture plant
4. Forage or cover crop
5. Processes Forage
6. A necessary element for plant life
8. General term for feeds
10. An important pasture seed crop
12. A vital part of a seed
15. A processed cattle feed
16. The King of crops
19. A forage plant in the south
21. Grazing land
22. The largest grain crop
23. An annual pasture crop
24. A general term for many pasture plants

DOWN

1. A method of seeding
2. A product to increase yield
3. For horses
7. Used for forage and hay
9. A winter growing legume
11. A fiber plant
13. A term for things we grow
14. A grain crop
17. A method of irrigation
19. The starting point in crop production

ANSWERS TO CROSSWORK PUZZLE

In alphabetical Order

Baler
Clover
Corn
Cotton
Crops
Ditch
Drills
Fertilizer
Fescue
Flax
Germ
Grains
Ladino
Lespedeza
Oats
Pasture
Rain
Rye
Seed
Silage
Sorghum
Sudan
Timothy
Vetch
Water

W O R K S H E E T

Matching Game and Seed Identification Contest

What to Plant: This exercise will assist the member to become familiar with various types of planting material.

☐ Fill in the square the number of plant material which applies

Type of Plant	Planting Material
1. Potato	☐ 1. Cuttings
2. Gladioli	☐ 2. Stolons
3. Sweet Potato	☐ 3. Seed
4. Daffodil	☐ 4. Tuber
5. Pea	☐ 5. Bulb
6. Strawberry	☐ 6. Corm
7. Geranium	☐ 7. Root
8. Bermuda Grass	☐ 8. Transplant

Identify the Common Name of Seed Displayed:

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

Matching Game and Seed Identification Contest

What to Plant: This exercise will assist the member to become familiar with various types of planting material.

☐ Fill in the square the number of plant material which applies

Type of Plant		Planting Material
1. Potato	[7]	1. Cuttings
2. Gladioli	[8]	2. Stolons
3. Sweet Potato	[5]	3. Seed
4. Daffodil	[1]	4. Tuber
5. Pea	[4]	5. Bulb
6. Strawberry	[2]	6. Corm
7. Geranium	[3]	7. Root
8. Bermuda Grass	[6]	8. Transplant

Conduct A Seed Identification Contest:

Select 20 samples of seeds. Display these on a table or tables. Number each sample. Each member is given a worksheet for use in identifying the samples. He will write the common name of each sample on the reverse side of the worksheet. Seeds common to the community are recommended for use in the contest.

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

W O R K S H E E T

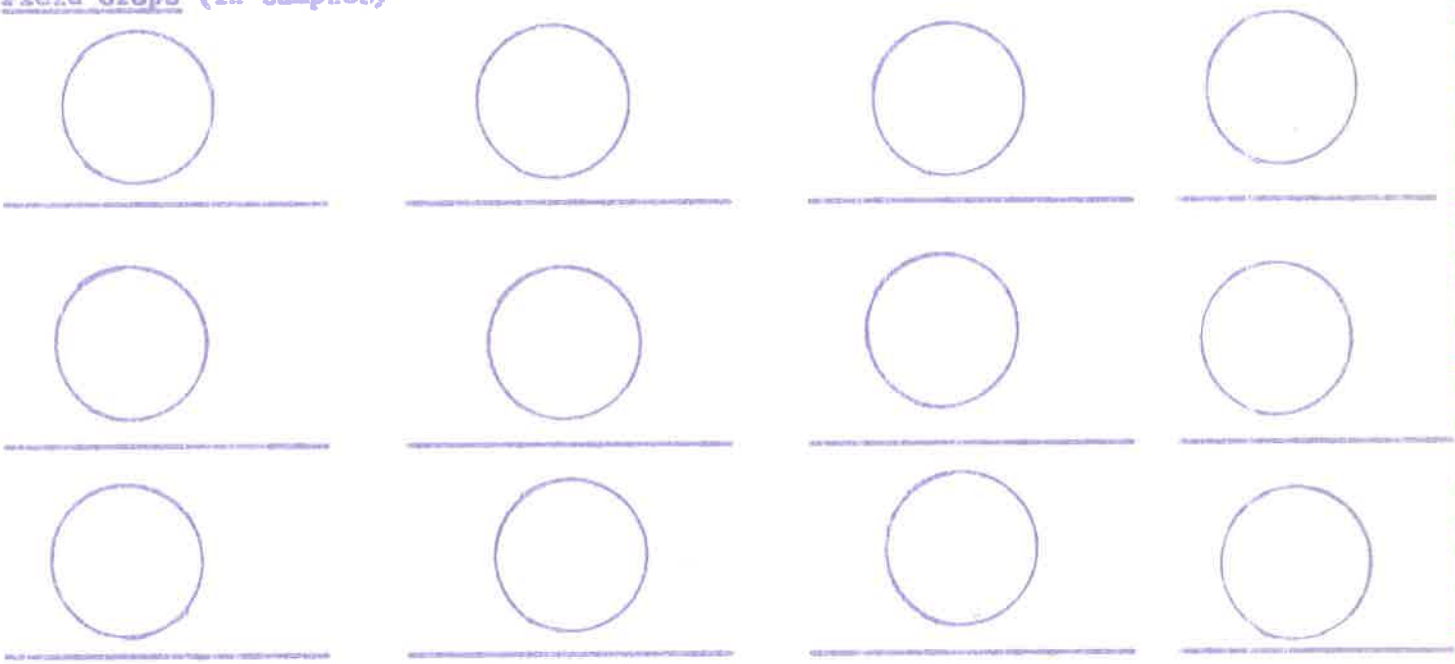
SEED IDENTIFICATION MOUNT

Learning to identify the different characteristics of seeds.

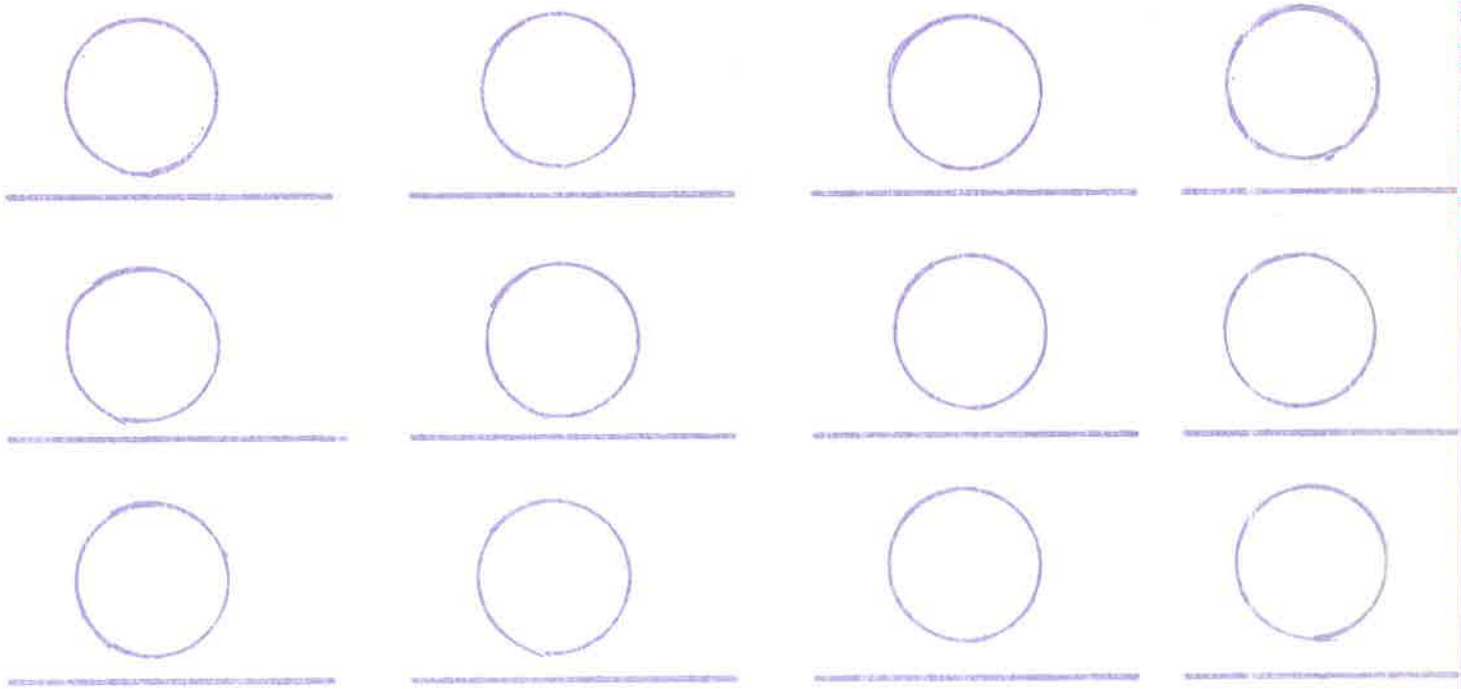
Seed Mounting Card:

Select and mount common seeds used in your area. Use a multi-purpose glue to mount the seeds filling in the circles below. Identify each seed mount below the sample.

Field Crops (12 samples)



Vegetable Crops (12 samples)



SEED IDENTIFICATION CARD

Suggested list of seeds which can be selected for mounting.

Field Seeds	Vegetable Seeds
Barley	Radish
Wheat	Tomato
Oats	Carrot
Rye	Squash
Grain Sorghum	Onion
Corn	Sweet Corn
Cotton	Popcorn
Alfalfa	Watermelon
Ladino clover	Cucumber
Rye Grass	Cantaloupe
Sudan grass	Beet
Safflower	Pepper
Sunflower	Peas
Sugar beet	Lettuce
Rice	Turnip
Beans	Cabbage
Vetch	Snap beans

W O R K S H E E T

IDENTIFY THE EDIBLE PORTION OF PLANTS

List plants which are examples of each type of edible plant material.

Edible Portion of Plant	List Plants Which Provide This Type of Material
Leaves	1. _____ 2. _____ 3. _____ 4. _____
Root	1. _____ 2. _____ 3. _____ 4. _____
Fruit	1. _____ 2. _____ 3. _____ 4. _____
Flowers	1. _____ 2. _____
Seed	1. _____ 2. _____ 3. _____ 4. _____
Stems	1. _____ 2. _____

W O R K S H E E T

A List of the Edible Portions of Plants

Edible Portion of Plant	Plants Providing This Type of Material
Leaves	1. Spinach 7. Lettuce
	2. Onion 8. Celery
	3. Cabbage 9. Rhubarb
	4. Parsley
	5. Water cress
	6. Chard
Root	1. Carrot
	2. Beet
	3. Turnip
	4. Parsnip
	5. Radish
Fruit	1. Tomato 7. Green Pepper
	2. Watermelon
	3. Cantaloupe
	4. Cucumber
	5. Egg Plant
	6. Squash
Flowers	1. Broccoli 3. Artichoke
	2. Cauliflower
Seed	1. Wheat
	2. Bean
	3. Corn
	4. Peas
Stems	1. White Potato
	2. Asparagus
	3. Kohlrabi

W O R K S H E E T #6

Visit to a Crops Processing or Packing Plant

Name_____ Type of Business Visited_____

Date of Trip_____ Name of Business_____

Location_____ Size of Operation_____

Member's Check Sheet
(Fill in during and after the trip)

1. What products are handled?_____
2. Who produces the product?_____
3. Length of shipping season_____ Daily Volume_____
4. Dates of shipping season_____
5. What operations are performed at the plant?_____

   _____
6. Who owns and operates the business?_____
7. How many people are employed at the plant?_____
8. What inspection requirements in this plant or the product packed subject to and who performs the inspection?_____

   _____

   _____
9. What grade standards are used for the product shipped?_____

   _____
10. How are your products marketed?_____ Wholesale_____ Retail_____
11. After the products leave the plant they are:

    _____ Delivered to stores by the plant. _____ Sold F.O.B.

    _____ Picked up at the plant by stores. _____ Sold through Commission

    _____ Sold directly to the consumer from the plant. _____ Sold by Broker

    _____ Sold directly to the Consumer on routes from the plant. _____ Sold at auction
12. How are the products shipped to market? _____Rail_____Truck_____Air
13. What records do you find necessary in this business?_____

    _____

    _____
14. How can a person prepare himself for employment in this field?_____

    _____

Questions for leader and members to ask.

15. _____
16. _____
17. _____

WORKSHEET #7

Tour a Wholesale or Retail Market

Name_____ Type of Business Visited_____

Date of Trip_____ Name of Business_____

Location_____ Size of Operation:

Large_____ Medium_____ Small_____

Member's Check Sheet
(Fill in during and after the trip)

1. How many different products are handled?_____
2. Is your business wholesale, retail or both?_____
3. Area served by wholesale market_____Population served_____
4. What method of selling is used? _____Cash _____Contract _____Credit
5. What methods are used to improve customer acceptance of products?_____

_____

6. How long are products held?_____Rate of turnover_____
7. How are agricultural products displayed? Where in the store are these located? ____

_____

8. Agricultural products represent what % of total sales?_____
9. From where do the agricultural products come?_____

_____

10. Who owns the facilities and the business?_____
11. What inspection requirements are there for your products?_____

_____

Who performs the inspection and when?_____

12. How many people are employed?_____
13. What are the career possibilities and what preparations are necessary for employment?_____
14. How many different operations are performed on your agricultural products between the producer and the consumer?_____

_____

_____

15. Major problems confronting business_____

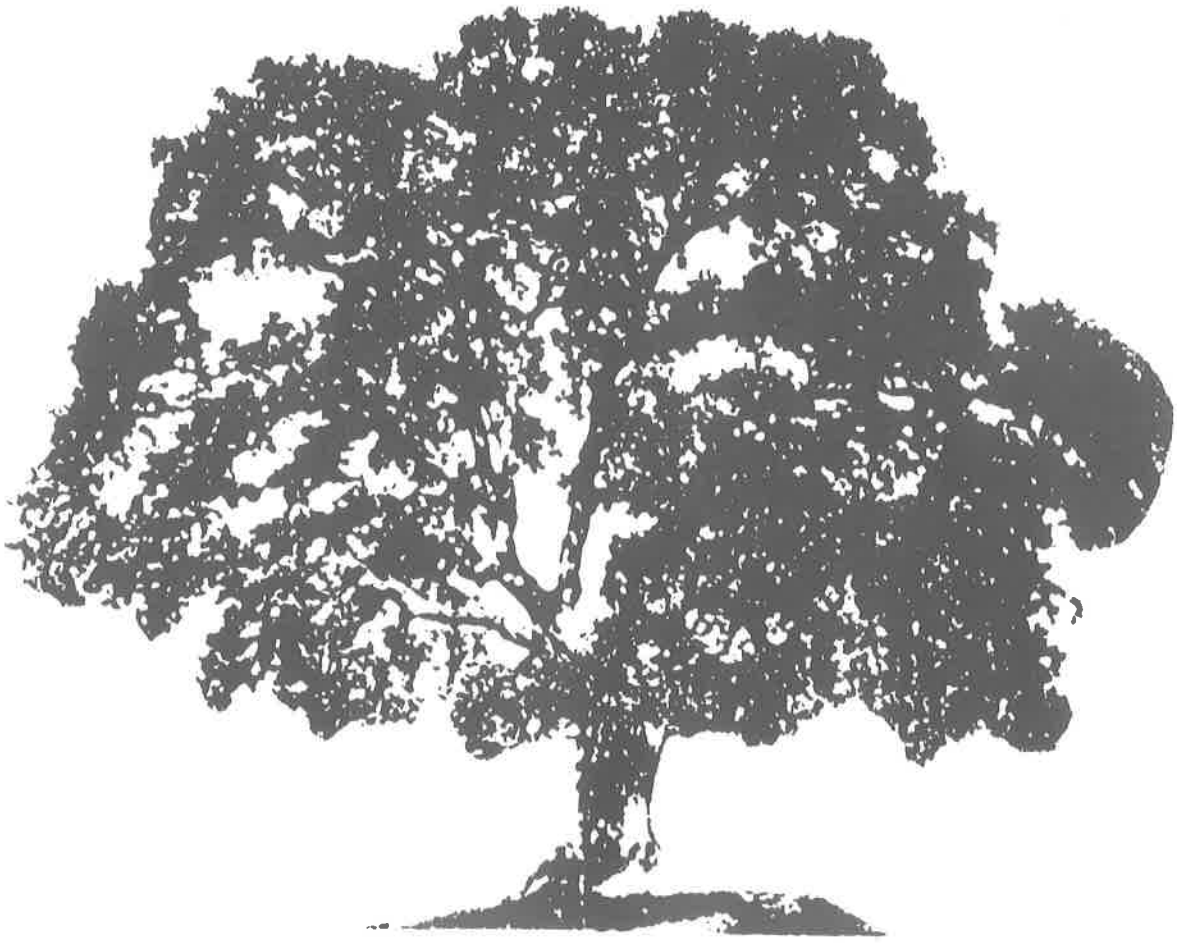
_____

Questions for leader and members to ask.

16. _____
17. _____
18. _____

4-H Youth Development

OAK TREE PROJECT



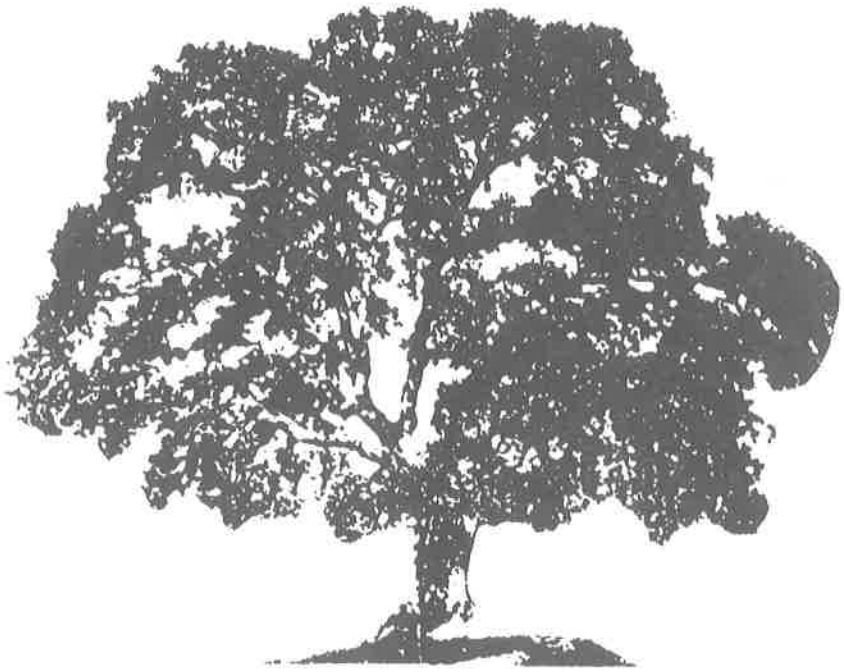
Cooperative Extension **University of California**
Division of Agriculture and Natural Resources
4-H-6046

This manual was prepared by Kenneth R. Churches, County Director and Farm Advisor; and Jennifer Mitchell, 4-HYD/Farm Program Coordinator, Calaveras County.

Contributors

Richard B. Standiford, Extension Forester; and Douglas D. McCreary, Extension Natural Resources Specialist, University of California, Berkeley.

Some information was extracted from "Living Among the Oaks," a publication of the University of California Cooperative Extension, Natural Resources Program.



In this project you have an opportunity to learn how oak trees grow, how they fit into their environment, and how they react to different cultural practices.

You will start by collecting acorns from oak trees near where you live. You will then proceed to plant, nurture, and eventually transplant your young seedlings in the field.

Your group project opportunities include:

- National Arbor Day activities
- newspaper coverage of your project
- planting trees in your own yard
- tree planting at your school

There are many other interesting activities and opportunities related to this project. You and your 4-HYD project leader may want to plan a field trip to identify various types of oak trees and the wildlife that inhabit them. This project also provides you with an excellent topic for 4-HYD demonstrations and class reports.

You can exhibit your young oak trees at county fairs and prepare a poster to show others what you have learned.

WHAT KIND OF OAK TREE IS IT?

Valley Oak
(Quercus lobata)

This tall, spreading oak was once an important member of the Central Valley's riparian forests. It is deciduous, which means it loses its leaves in the winter. Since it generally grows on deep fertile soils, many areas where valley oaks once grew have been converted to agriculture and the valley oaks were cut down. It can still be found from Shasta County to Los Angeles County, where it often grows to large size. It is a conspicuous oak in the hardwood range, especially in valley bottoms and on deep alluvial soils.

Blue Oak
(Quercus douglasii)

This deciduous oak is the dominant oak of the hardwood range. Surrounding the central basin of California from Shasta County to Kern County, it shares its range with the valley oak. Blue oaks occupy the more shallow soils, steeper slopes, and upland sites. In the foothills, it often grows in association with interior live oaks and digger pine.

Coast Live Oak
(Quercus agrifolia)

This is an evergreen oak found from southern Mendocino County southward into northern Baja California, primarily west of the coast ranges. In the southern portions of its range, it replaces the valley oak in the hardwood range, and in the valley and alluvial sites, it often attains a tall, spreading appearance.

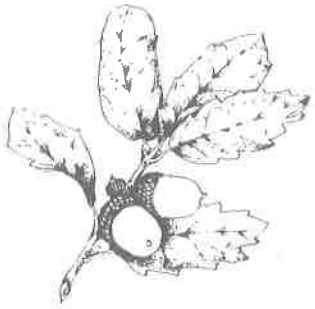
Interior Live Oak
(Quercus wislizenii)

This evergreen oak is widely distributed in California from Siskiyou County south into Baja California. It is abundant in the Sierra Nevada foothills and in the coast ranges it occupies the higher, drier, or more inland sites than the coast live oak. Interior live oak is often found in heavily wooded sites and in chaparral habitats or other dry locations. It often develops a shrubby form. If the top is killed by fire, it will sprout vigorously from its base.

Engelmann or Mesa Oak

(Quercus engelmannii)

This semideciduous oak has a limited distribution in less than 2 percent of the state—primarily in western San Diego County. There, the mesa oak replaces the blue oak in the hardwood range.



Black Oak

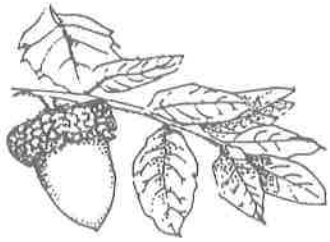
(Quercus kelloggii)

This oak generally grows on moister sites at elevations above 1,500 feet. It often grows in association with both ponderosa pine and incense cedar. Before the leaves fall in winter, many turn bright yellow. Mature leaves are 3 to 6 inches long and are deeply cut or lobed. Leaf tips are sharp and pointed. The bark is dark grey and the trunk often rises 10 or 20 feet before branching. The acorns, which are about 1 inch long and 3/4 inch wide, are lemon-shaped at their end. Like the interior live oak, the black oak will sprout readily from its base if the top is cut or killed by fire.

Canyon Live Oak

(Quercus chrysolepsis)

This oak is also called "golden cup" oak because its acorns have large cups that are covered with a golden fuzz or powder. This species generally grows above 1,500 feet in sheltered canyon bottoms and northerly slopes. It grows abundantly along the canyon bottoms of the South Yuba River. Trees generally branch several times near the ground and rarely form as a single trunk. Its bark is thin, grey-brown, and becomes flaky with age. The leaves remain on the tree in the winter and can either have a smooth edge or be hollylike. Leaves are 1 to 4 inches long and curled at lower edges. The upper leaf surface is dark yellow-green and polished; the under surface is often fuzzy. Acorns have large golden cups and are egg shaped at the end. Due to its thin, flaky bark, this species is very sensitive to fire. However, like interior live oak and black oak, it is a vigorous sprouter.

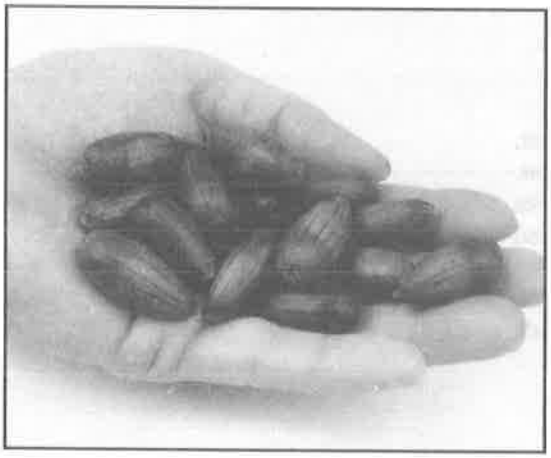


ABOUT OAKS

The majestic oak trees that add beauty to our state have been around to see many changes. Some of these stately giants were mere seedlings over 200 years ago. They have witnessed California becoming a state, the invention of the automobile, and yes, even the first television set.

Weather worn branches, massive frames, and fresh green leaves add to their awesome beauty. Travelers photograph them, children climb in them, birds rest in them, and deer find shelter under them. Oaks give us many things. They provide shade for us while on a picnic or playing in our yard. Oak trees help to increase property values by virtue of their beauty. A carefree landscape is easy to achieve when oaks are a part of it. Oak trees provide food and shelter for wildlife, and wood for our furniture or fireplaces. And finally, they anchor the soil and help to prevent erosion.

In many areas, some species of oaks are having a tough time surviving and regenerating. As a person concerned with survival of natural beauty, you can learn to help protect existing trees and help new trees to get a start on life. You have an opportunity to start a young tree that many people will be enjoying over the next 200 years.



COLLECTING ACORNS

One of the most exciting aspects of starting a new oak tree is collecting the acorns you will use. The most important first step is to decide what kind of oak you would like to grow. The descriptions found on pages 2 and 3, "What Kind of Oak Tree Is It?" may help you decide.

After they fall to the ground, acorns are quickly attacked by insects, birds, and rodents. It is best to collect acorns shortly after they fall to the ground between September and December. Look for shiny, plump, freshly fallen acorns that do not have any worm holes. If a cup still clings to the acorn, you should carefully remove it. You can even collect acorns right from the tree branches. Since every acorn will not produce a seedling, it is best to collect two or three acorns for every tree you would like to have. You can test them by soaking them in a pail of water for 1 hour, keeping those that sink. If an acorn floats, it has probably been attacked by insects or has not fully ripened. Acorns that may have remained on the ground for several days should be soaked up to 24 hours before throwing out floaters.

STORING ACORNS

If you are unable to plant your acorns soon after collecting them, it is important that you store them correctly. One of the best storage methods is to place them in a resealable plastic storage bag. This bag should then be sealed and put in the refrigerator.

Storage as described above will prolong the acorn's ability to sprout and grow. But remember acorns are living things and they will deteriorate with time. It is best not to store acorns for more than a couple of months before planting. Blue oaks are especially difficult to store, since after 2 months their roots often start growing, even while they are in the refrigerator!

PLANTING ACORNS

November is an ideal time to plant your acorns. Selecting the proper containter can have a major impact on the success or failure of your project. An acorn will send down a strong tap root very quickly. Therefore, deep containers are most important. One-gallon size containers are most desirable. You may use plastic nursery containers, empty coffee cans, plastic milk jugs, or similar containers. Be sure that there are five to seven holes on the sides near the bottom to allow excess water to drain.

Place a good loose potting soil in your container to a depth of 1 inch. Then sprinkle 1/4 teaspoon of a nitrogen fertilizer (21% or lower) over the soil. Now you can fill the container with the same potting soil to within 2 inches of the top of the container.

You may now lay five of your acorns on their sides in the soil. Then cover them with 1 inch of potting soil. This will leave you with 1 inch of can visible above the soil level to hold water. Soak the soil well and keep it slightly moist at all times. The soil should never remain saturated. It is a good idea to make a label for your container that shows your name, the planting date, and the kind of oak tree you are growing. It is best to keep your container outside in a sunny location. This will help to keep the oak tree adjusted to its environment.

Do not expect to see your first leaves for 6 to 8 weeks. When the seedlings have developed 2 or more leaves, you can thin them out, leaving only the strongest 2 seedlings. Simply clip off the weakest seedlings at the soil level.

TRANSPLANTING YOUR SEEDLINGS

Your young trees should be transplanted into the ground during February or March. If you can plant them on National Arbor Day, it will make the event even more special. Remember, your trees may live for a very long time so consider a planting location very carefully.

Start by digging a hole twice as large as the can. This will help to loosen the soil so that the young tree can develop new roots easily. Water your trees very well before removing them to be planted. Do not attempt to separate the two trees growing in the can, but rather plant them and the soil root ball as a unit. After the seedlings are well established, the weaker one can be clipped off at soil level. Keep as much soil from the can on the roots as possible. It may be difficult to transplant your seedlings if the soil falls from the roots. Try your best to keep the soil intact. If the soil does fall off, plant the roots as carefully as you can. If roots have grown so long that they are curving around the inside of the can, cut them so they are straight.

Carefully place the young tree in the hole so that both soil levels are even. Refill the hole. It is very importatnt to now soak the soil thoroughly. Normal rains should then provide adequate soil moisture until the dry season.

CARING FOR TRANSPLANTED OAKS

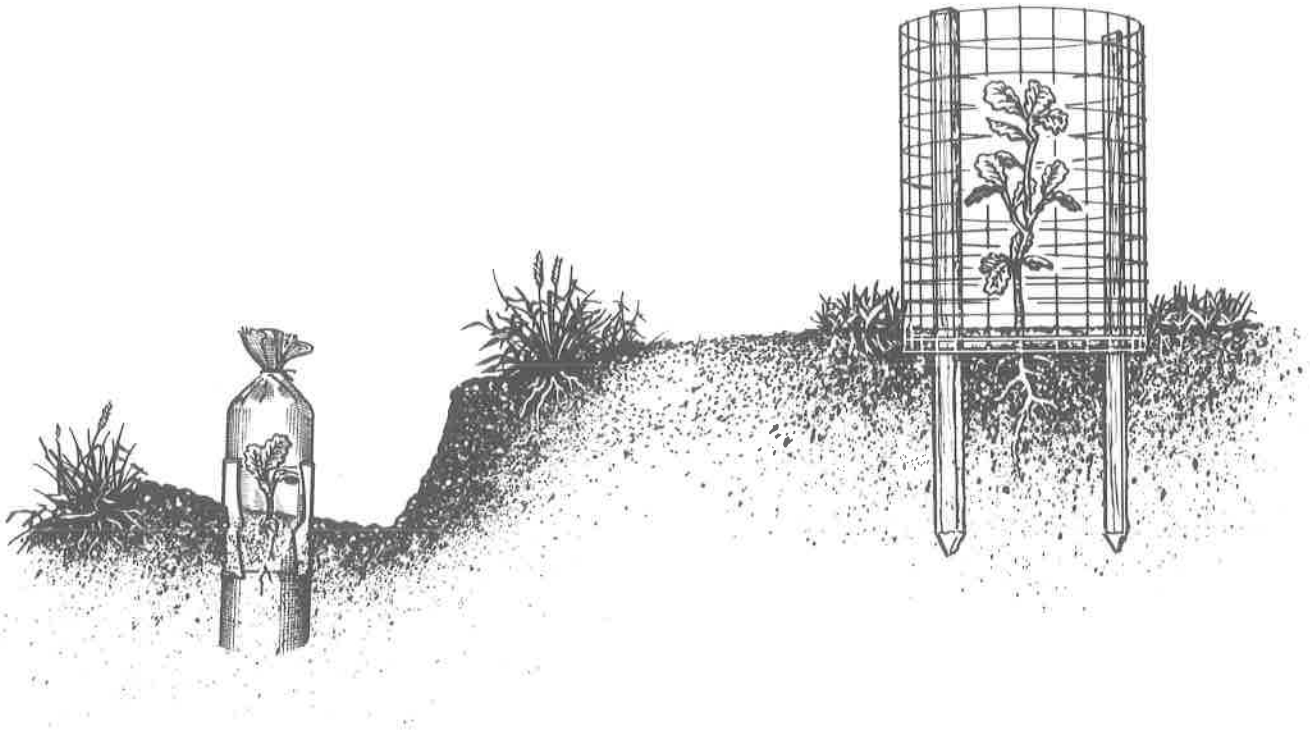
Watering. During the first dry season of your tree's life, irrigation will be necessary. Thoroughly soak seedlings every 2 weeks so that water penetrates the soil deeply. You can reduce watering frequency as the trees become established, and after 2 years you should no longer have to water them.

Weeding. Weeds that grow around your trees will use up valuable soil moisture and nutrients, and can block necessary sunlight. Use a hoe or hand-pull all weeds within 2 feet of the tree. A mulch of straw, grass clippings, or other organic matter can help to reduce weed growth and hold in soil moisture. Pinch off tips of unwanted side branches to encourage fast upward growth during the first year.

SEEDLING PROTECTION

A tender young seedling is an attractive source of food for ground squirrels, birds, livestock, deer, and rabbits. An exclosure made of aluminum window screen, wire fencing, or other such material can give your seedling a much better chance of surviving. Generally, the exclosure can be removed when the tree reaches a height of 4 to 5 feet.

Two frequently used exclosure devices designed to protect seedlings from ground squirrels, birds, and deer.



Two frequently used exclosure devices designed to protect seedlings from ground squirrels, birds, and deer.

4-HYD OAK TREE PROJECT

You Will Need
- acorns
- potting soil
- fertilizer
- container(s)
- labels
- hand-trowel or shovel
- window screen or wire fencing

What You Can Do
- Plant your trees on National Arbor Day.
- Have your local newspaper attend the tree-planting event.
- Plant trees where a fire has destroyed existing trees.
- Plant trees in a new development area.
- Plant trees where wildlife can benefit.
- Give a demonstration about oak trees to a school class, convalescent hospital, or other community group.
- Report location and number of trees planted to your local farm advisor's office.

RECORD OF YOUR PROJECT

Date acorns collected _____

Planting date _____

Kind of oak tree planted _____

Type of fertilizer used _____

Amount of fertilizer used _____

Date planted in field _____

Locations of trees planted _____

_____

Dates of irrigation _____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Type of exclosure used _____

_____

DISEASES AND PESTS OF OAKS

Once an oak tree becomes well established in a natural setting, it is usually fairly resistant to insects, diseases, and animals. However, trees can be damaged and are occasionally killed. During years of drought the trees may become weakened and thus more susceptible to disease or insect attack

Animals. While the oak tree is less than 5 feet in height, animals can be a serious enemy. Rabbits, ground squirrels, deer, and livestock may eat the entire seedling or remove all leaves. As the tree matures, animals usually do not cause serious problems. You may have noticed that oak trees growing in a grazing area have all lower leaves and stems eaten off to a height of about 5 feet from the ground.

Insects. Many insects find oak trees a very nice place to live. Usually, they do not seriously damage healthy and mature trees. The oak gall, for example, is a harmless swelling of branchlets in reaction to enzymes released where a wasp lays its eggs. These galls can be so abundant, colorful, and multiformed that they resemble dangling Christmas tree ornaments.

Other insects can damage and certainly disfigure mature oaks. Oak leaf moths and other leaf-eating insects are examples. During outbreaks they can eat most of the foliage on a tree and cause a mess underneath. However, their leaves usually grow back when the population of these insects declines. During drought years when trees are stressed, mature oaks can also drop their leaves early to conserve moisture. These trees usually recover the following year with no noticeable harm.

Mistletoe. This parasitic shrub develops sticky berries that are carried from tree to tree by birds. The berries then grow into the branches and may cause structural weakness. They can also weaken trees by using moisture and nutrients, but rarely do they actually kill a tree. Trees with large mistletoe infestations are very vulnerable to branch breakage. Mistletoe is best controlled while the infestation is small. After the mistletoe is cut out, cut back the oak's bark around the spot where the mistletoe stem entered the oak branch.

Diseases. Probably the most important disease of native oaks is something called "oak root fungus." This disease thrives in warm, moist conditions and can seriously damage or kill mature, established trees. People who build homes near native oaks can unknowingly cause this problem by planting lawns and other water-loving plants around the trees. When these plants are watered in the summer, the oak root fungus starts growing on the oak's roots. Eventually the fungus can cause so much root damage that the tree dies.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. Kenneth R. Farrell, Director of Cooperative Extension, University of California.

5m-pr-6/90-LTE/ALS

4-H Christmas Tree Project

LEADER'S GUIDE

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

4-H–6011

REPRINTED MARCH 1979

This publication was planned and written by a Forestry project development committee in 1968.

Members were —

Robert Davis
William Ruddiman
Arthur Scarlett
Gerald St. Andre
Charles Wilson

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture, James B. Kendrick, Jr., Director, Cooperative Extension, University of California.

1½m–3/79–LB/LAM

4-H Christmas Tree Project

LEADER'S GUIDE

FIRST YEAR
PLANTING CHRISTMAS TREES

INTRODUCTION

Meetings are planned for two in October, two in November, one in December, and then one a month until done for the year.

MEETING ONE — 1st Year, Tree Planting

1. Organize project group.

   Get names and addresses of members.

   Issue calendar sheets for 4-H records.

   Get members acquainted.

2. Explain project plans for year.

   Briefly review what members will do and learn.

   Discuss cost of project with members.

   Members should plan to buy and plant as many trees as they can afford. Minimum 5-6 trees.

MEETING TWO

1. Order trees — bare-root trees to plant in 4th meeting. Locate a source of trees in gallon cans or other containers. Order or arrange to pick up before meeting three. See section on tree selection and planting. (I)

2. Show how to select planting sites for trees. Demonstrate in backyard. Have members pick planting sites at home before next meeting. See Section I.

3. Select species adapted to area and project: Monterey pine for most of California and Sierra redwood for mountain counties. See Section IV.

MEETING THREE

1. Obtain trees before meeting. Issue to members and collect money.

2. Demonstrate planting tree in ground. See tree planting section in manual. (I)

3. Demonstrate care of trees – watering, weed control, rodent control. See section on tree care. (II)

4. Have members bring gallon cans to next meeting after planting trees in ground.

MEETING FOUR

Show members how to plant bare-root seedlings in gallon cans (to replace trees planted in their yards) or directly in the field.

MEETING FIVE

1. Show members how trees grow, leaders, branches, roots. See section on tree growth.

2. Show members how to prune leader and shape side branches on seedlings planted in ground.

3. Have members be able to identify tree parts.

4. Plan tour for next meeting. See section on tours. (VIII)

MEETING SIX

Hold project tour — visit all members' homes and view planted trees. Have members judge quality of work.

MEETING SEVEN

1. Have members prepare and practice giving demonstrations — encourage participation in county event. See Leader's Guide to 4-H Demonstrations.

2. Plan for field trip. See field trip section. (VIII)

MEETING EIGHT

1. With parent help take members on tour of nursery or choose-and-cut Christmas tree operation.

2. Emphasize tree care and management.

3. Discuss Christmas tree species.

MEETING NINE

Sell seedlings in gallon cans. See section on selling trees. (VII) Have members bring calendars to next meeting.

MEETING TEN

1. Issue project report sheets to members. Show how to complete from information on calendars.

2. Tell members about entering in fair. Show how to make out fair entry and prepare plants for show.

SECOND YEAR
TREE CARE AND GROWING

INTRODUCTION

If possible, hold first five meetings before Christmas. Follow with rest of meetings about once a month. Plan tours, field trips, demonstration and fair meetings to fit county event calendar.

MEETING ONE — 2nd Year, Tree Care

1. Organize group.

2. Explain project for the year.

3. Discuss cost of project and probable income.

4. Order seeds.

MEETING TWO

1. Plan Christmas tree sale — trailer size container trees.

2. Show how to stratify seed — prepare for germination. See section on seeding. (III)

3. Demonstrate cutting test and show how to figure probable germination. See seeding section. (III)

MEETING THREE

1. Demonstrate pruning and shaping of trees. See tree terminology and shearing section. (V and VI)

2. Discuss weed and rodent control. See care section. (II)

3. Order potted and bare-root seedlings.

MEETING FOUR

1. Show how to prepare seedbed — in gallon cans or box 6'' deep. See seeding section. (III)

2. Plant seeds — enough to grow 25 trees. See seeding section. (III)

3. Plant trees — bare-root trees in cans. Have members take gallon-can trees home to plant as replacement for trees to be sold later in the year.

4. Demonstrate root prunings for living trees.

5. Show containers for trees. Papier maché and wood. See section on selling trees. (VII)

MEETING FIVE

Conduct tree sale (November). See section on selling trees. (VII)

MEETING SIX

Discuss and demonstrate care of trees and seedlings — damping off, insects, weeds, rodents. See section on tree care. (II)

MEETING SEVEN

1. Have members prepare and give demonstrations. Plan to take part in county field day. See Leader's Guide to 4-H Demonstrations.

2. Plan project tour.

MEETING EIGHT

1. Conduct project tour. Have members judge quality of trees at each home.

2. Plan for field trip.

MEETING NINE

Have field trip to Christmas tree plantation, cutting operation, or tree nursery.

THIRD YEAR
LIVING TREE SALE

INTRODUCTION

If possible, hold first five meetings before Christmas. Follow with rest of meetings about once a month. Plan tours, field trips,

demonstrations and fair and record book meetings to fit county calendar.

MEETING ONE — 3rd Year, Tree Sale

1. Organize your group — issue records, etc.
2. Explain project activities for coming year.
3. Discuss cost and probable income.
4. Demonstrate shearing and shaping to produce living trees.
5. Order trees if needed.
6. Discuss pest control.

MEETING TWO

1. Demonstrate planting gallon-can stock in ground. Discuss rotation of planted trees.
2. Demonstrate root pruning for living tree sale.
3. Discuss care of pruned trees before sale.

MEETING THREE

1. Prepare for Christmas tree sale:
   a. Living trees.
   b. Cut trees.
2. Discuss and demonstrate "turn-up" culture. See section VII on "Turn-Ups"

MEETING FOUR

1. Obtain containers for living trees — papier mache, wood, pottery.
2. Demonstrate lifting and potting trees from the ground.
3. Discuss care of transplants prior to sale.

MEETING FIVE

1. Hold living tree sale — door-to-door or by advertising.
2. Lift trees — by first weekend in December.

MEETING SIX

Plan replacement of sold trees from potted stock.

MEETING SEVEN

Outline simple fertilization trial.

MEETING EIGHT

Plan participation in demonstrations. Older members may help younger ones rather than participating as demonstrators.

MEETING NINE

Field trips (during Christmas season). Visit "choose and cut" operation, Christmas tree lot, cut tree operation, etc.

MEETING TEN

1. Plan for fair participation.
2. Prepare project reports for submission to county.

FOURTH YEAR
CHRISTMAS TREE PRODUCTION

MEETING ONE – 4th Year, Tree Production

1. Organize group – issue records, etc.
2. Order trees as needed by group.
3. Discuss and demonstrate second phase of stump culture – leader selection, etc.

MEETING TWO

Shearing and pruning cultured trees.

MEETING THREE

Chemical weed control in tree plantings.

MEETING FOUR

1. Plan for Christmas tree sale.
2. Procedures for living and cut-tree marketing.

MEETING FIVE

1. Lift and sell living trees.
2. Cut and sell cut trees.
3. Plant replacements for living trees sold.

MEETING SIX

Discuss and demonstrate pest control in the tree farm.

MEETINGS SEVEN AND EIGHT

1. Study costs and returns on Christmas tree production.
2. Plan for project expansion where possible.

MEETING NINE

1. Judging trees.
2. Grading trees for tree quality and pricing.
3. Preparing for fair participation.

MEETING TEN

1. Prepare project reports.
2. Review records and cost of production.

4-H Christmas Tree Project

I

PLANTING CHRISTMAS TREES

Obtaining Planting Stock

Planting stock is forest tree seedlings — small plants raised from seed in a prepared seedbed. Planting stock (seedlings) raised in a seedbed for 1 year is known as 1-0 stock. Seedlings grown 2 years are known as 2-0 stock. The first number represents years in the seedbed, and the second, years in a transplant bed.

You can obtain planting stock from private or public nurseries. Lists of commercial nursery dealers are available from the U.S. Forest Service, the California Division of Forestry, and your local farm advisor's office. A Christmas tree producer in your area may have a supply of planting stock. Seedlings planted in containers (potted trees) may be purchased from private nurseries or the State Forest Nursery. Trees should be at least 1 year old. The recommended species of seedlings and potted trees for your Christmas tree project are either **Monterey pine** or **Sierra redwood**, depending upon where the member lives. Sierra redwood must be grown where temperatures fall below 15 F.

Seedling and potted stock costs in California vary depending on the age of the stock and the tree nursery.

Site Selection

Choose a fairly level site (location) with good drainage. Avoid sites where water may stand and flood the planting. On a steep site, heavy rains may injure or wash out the planting. An easy-to-get-to area is easier to care for and protect. Clear open sites give more air circulation, especially during hot dry periods. Avoid planting under larger trees. Irrigation water should be available. The site may be in the member's yard.

Choose a site not heavily infested with weeds. A sandy loam is better than heavy clay for growing nursery stock because clay soils have poor drainage, crack and break more readily during extremely dry periods, and endanger the life of the trees.

A fence should protect the site if there is a chance of animal damage or of people trampling seedlings. Fencing should be rodent proof if possible. Screening to keep out field mice may be too expensive, but 1-inch-mesh poultry wire will keep out rabbits and larger rodents.

Good places to plant:

- deep soil
- good drainage
- free of brush and grass

- generally north and east facing slopes
- few signs of animal damage

Irrigation, chemical weed control, weeding, hoeing or cultivation now allow Christmas tree growers to grow trees where climates are too severe for normal forest planting.

Working the site so that it is in the best possible physical condition before planting will increase planting survival.

Care of Seedlings Before Planting

When delaying seedling planting, be careful to protect the young seedling from drying out. Even a few seconds of exposure to air can permanently damage the roots. If seedling planting is delayed for a few days, heel in roots in the soil (figure 1) and keep soil moist. If planting is delayed for a few hours, wrap seedlings in moist burlap sack.

Figure 1. Heeling in trees for short-term storage (white Vermiculite added to give photo contrast).

Tips to remember:

- If planting is delayed, heel in trees or seedlings as soon as they arrive from the nursery. Use shady area for heeling in.
- Keep roots moist and covered at all times. Roots will dry out in a few seconds if exposed to air.
- Water heeled-in stock twice a week.

Spacing

Spacing may vary, depending on the circumstances of each member. If cultivation is planned for Christmas trees, space rows according to equipment width. Commercial growers of large plantings who are using chemical weed control plant trees on 4- x 4-foot spacings.

Planting Trees in the Field

Attention to proper details in planting is more important than the tools or method. Successful planting depends mainly upon good planting stock whose roots are never allowed to dry out. When carrying trees in the field have the members enclose the roots in a waterproof bag, bucket, or similar container. Always pack moist material around the roots to keep them damp. When planting, the roots should contact damp ground only. They should hang down without bunching or curling, have soil firmly packed around them, and be at the same depth as they were originally grown in the nursery.

Avoid these tree planting errors.

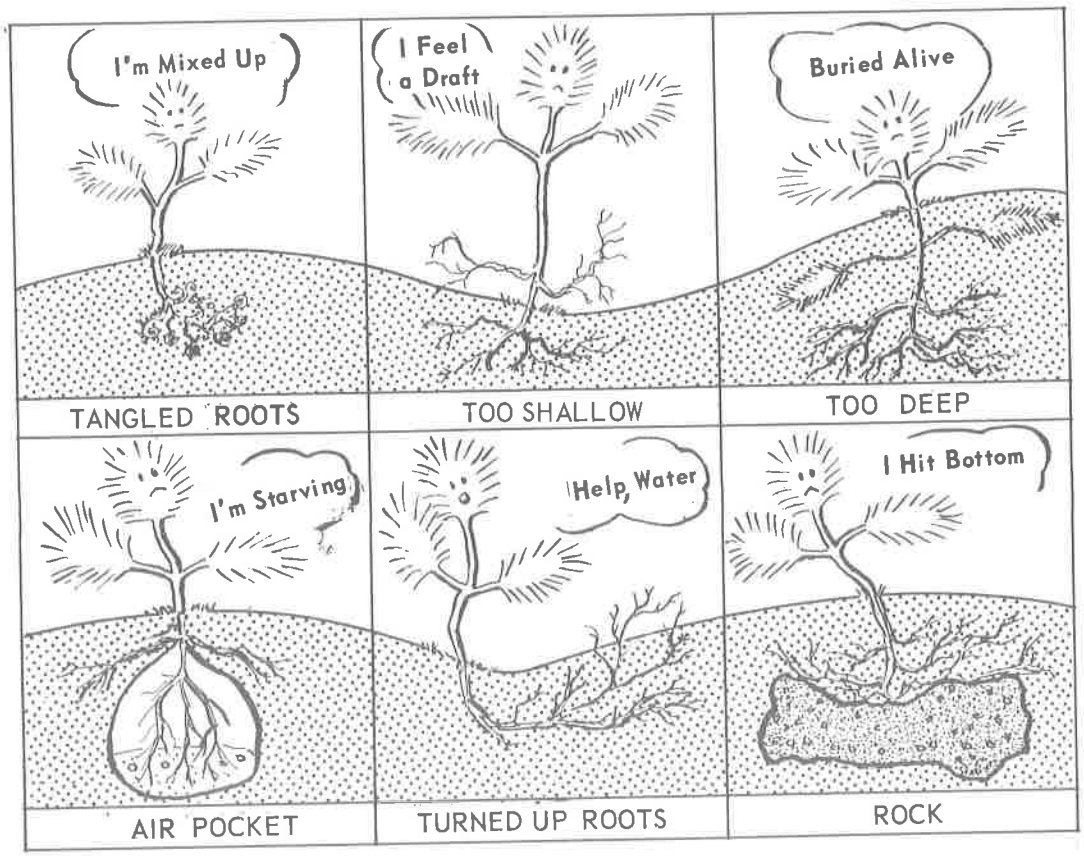
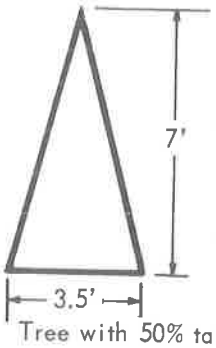


Figure 2. COMMERCIAL SPACING*



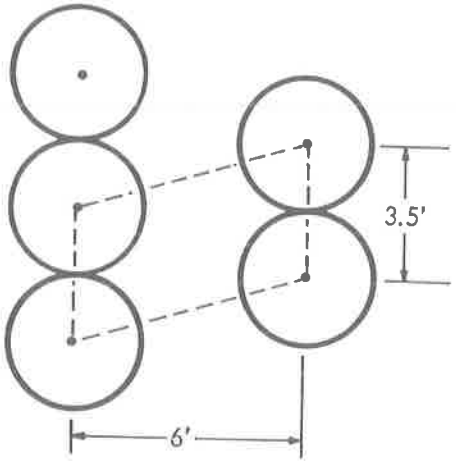
Tree with 50% taper

If you have only a small plot of ground to use for Christmas trees how can one get the most trees in the space available? First the trees must be sheared to a 50% taper. The formula for figuring taper is:

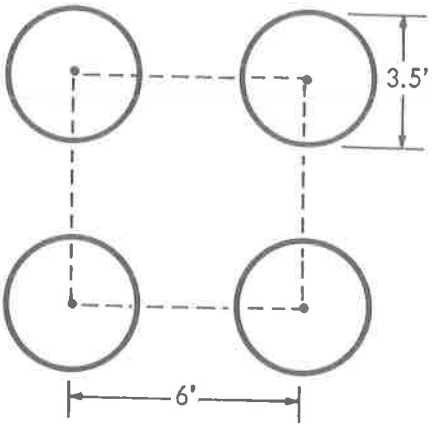
$$\% \text{ taper} = \frac{\text{width of base}}{\text{height of tree}}$$

or for the tree shown to the left:

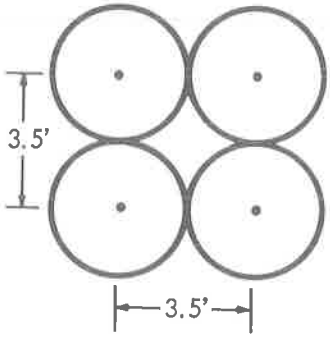
$$\% \text{ taper} = \frac{3.5'}{7'} = 50\%$$



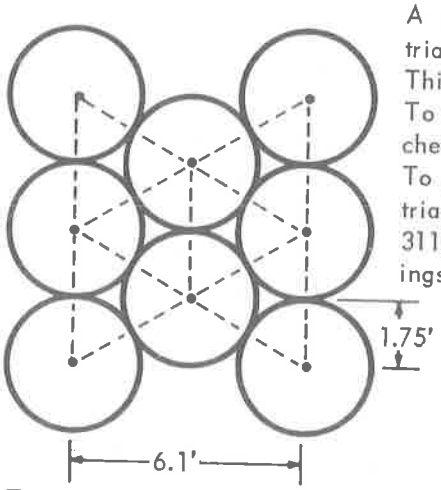
Rectangular spacing of 6' x 3.5' = 2070 trees per acre.



Square spacing of 6' x 6' = 1210 trees per acre



Square spacing of 3.5' x 3.5' = 3550 trees per acre.

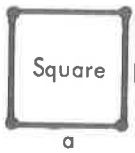


Triangular spacing of 1.75' x 6.1' = 4070 trees per acre.

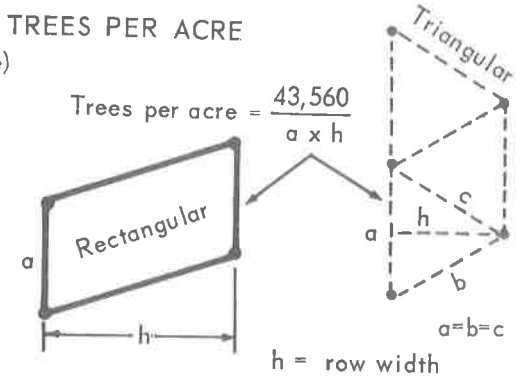
A maximum number of trees can be planted in an area using triangular spacing of 3.5' on a side.
This gives a row spacing of 6.1' one way and 1.75' the other. To use this type of planting you must shear to a 50% taper, use chemical weed control, and sprinkler irrigation.
To give the trees a little more room you may wish to use a 4' triangle. This would require row spacings of 7' x 2', and gives 3110 trees per acre compared to 4070 for the 1.75' x 6.1' spacings.

FORMULA TO FIGURE TREES PER ACRE

(43,560 = sq. ft. per acre)



$$\text{Trees per acre} = \frac{43{,}560}{a \times b}$$

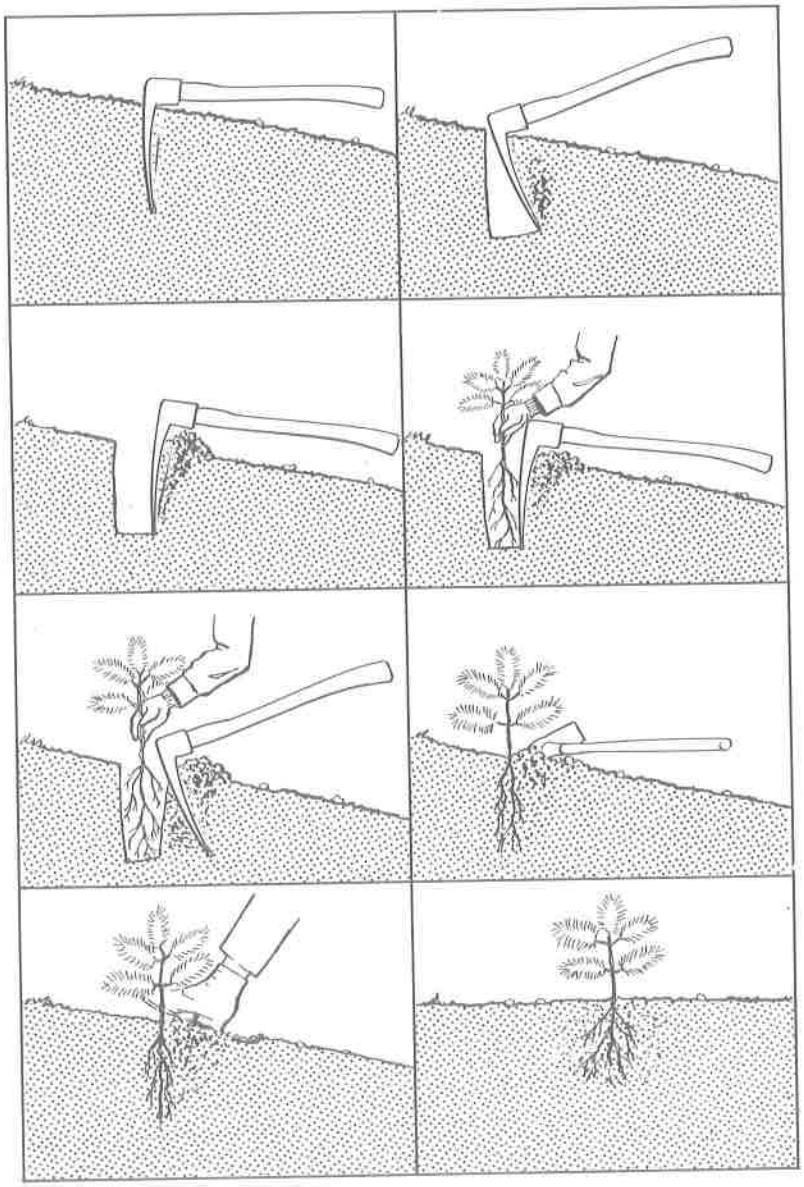


h = row width

*NOTE: The spacing explanations given here are for large commercial plantations depending on the number of trees to be grown in an area. The information may be useful in planning the member's plot size and arrangement.

Hand planting in California is done with either a **planting bar** or **western planting tool**. The **planting bar** opens up a slit 8 to 10 inches deep and wide enough to insert tree roots, and is especially useful for loose or prepared soil. The **western planting tool** is a type of hoe with a narrow blade long enough to open a hole 10 inches deep in almost any kind of soil. It is also good for working steep ground. A shovel or tile spade can be used like a planting bar for seedlings whose roots are too wide for the slit made by a planting bar.

Steps in tree planting, using the western planting tool.



Planting in Containers

Container plants need proper care if they are to grow. Some important considerations are **location, watering, fertilizing** and, when necessary, **repotting.** A good container of soil may be made from the same mix as that on page 11. This mixture may be improved by adding small amounts of plant nutrients.

When potting or repotting seedlings, use containers having a drainage hole in the bottom. Water-tight pots are difficult to care for properly. Water tends to collect in the bottom of the container and injure the plant roots. When roots fill the container the seedling's growth slows. For the tree to resume vigorous growth it must be repotted in a larger container and fresh soil or placed under field conditions.

Vigorous trees with well-developed roots, free from abnormal circling, kinking or twisting can be produced in the field or in containers.

All too often the defective root system is the main cause of the plant's failure. There are two root defects most often encountered — the more familiar is circling of the roots leading to root girdling as the roots increase in diameter. The other is sharp bending or kinking of the trunk or main root. Both frequently occur on the same plant.

Attention to good nursery practices can reduce these problems and may even enhance the growth of the trees while in the nursery as well as when planted in the field.

Trees in 1-gallon and 5-gallon containers may develop serious root problems from girdling roots or from becoming root bound when left too long in containers. Proper root pruning before planting will correct many of these problems. Most seedling roots are longer than the depth of the container in which they are to be placed. Sharply bending or kinking the seedling roots when placing the seedling in the container creates a weak point. Small pots, particularly those of impermeable material, can induce root circling especially since conifers have tap roots on their rapidly growing plants. Prune the root properly when moving to the next size container or root circling may cause poor plant growth and poor performance in the field.

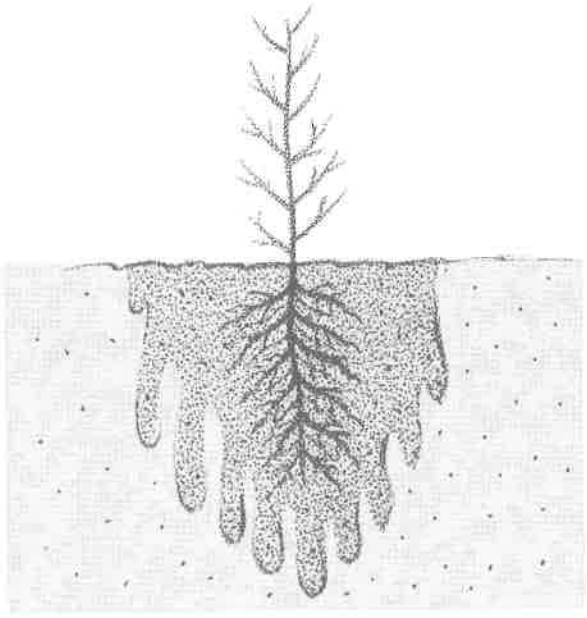
II

TREE CARE

Trees purchased by members or leaders are not only an investment but a potential cash crop. These accepted cultural practices are recommended to protect both investment and income.

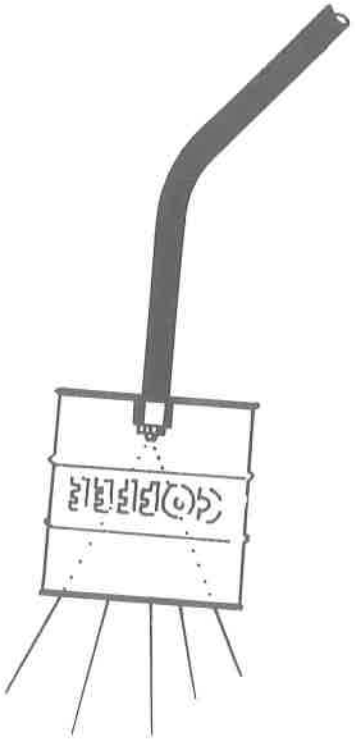
Watering

Too much water is as bad for the tree as not enough. A good rule of thumb — there is enough available water for the tree if you can ball up a handful of soil. The color of a moist soil appears darker, a dry one usually looks lighter. Take a visual check or an actual soil sample as close to the tree's root zone as possible without damage. Watch potted trees closely during the hot summer season, making sure moisture is available to the seedling at all times. This is a period of fast growth and seedlings require adequate watering.



Weed Control

Controlling weeds is an important cultural practice and should be emphasized to all members. Weeds not only take up space but actually compete with Christmas trees for moisture and root spacing. During the first year, the member can cultivate (hand hoe) all weeds from his plot. Do not allow weeds to grow within 2 feet of the trees. Advanced members can use chemical weed control methods to eliminate weeds. Weed oil is an inexpensive agent to use and can be purchased at most service stations or larger nurseries. Paraquat is another chemical that can be used with excellent results. Spraying the live weeds once a month with 1 tablespoon of paraquat per gallon of water should be sufficient. Care must be taken not to hit the trees with the spray material.



Coffee can on end of spray nozzle protects tree from being hit by spray.

Fertilizer

Fertilizer must be applied carefully. Fertilizer should not be allowed to come in direct contact with the tree roots. Second and third year trees may benefit from fertilization if applied at the proper time and in the proper amounts. A balanced fertilizer (16-16-16) can supply the nutrient requirements of Christmas trees. The following table gives the recommended rates per tree for each type of fertilizer for each year.

	Second Year		Third Year	
	oz	cups	oz	cups
8-8-8	24	3	24	3
16-16-16	12	1½	12	1½

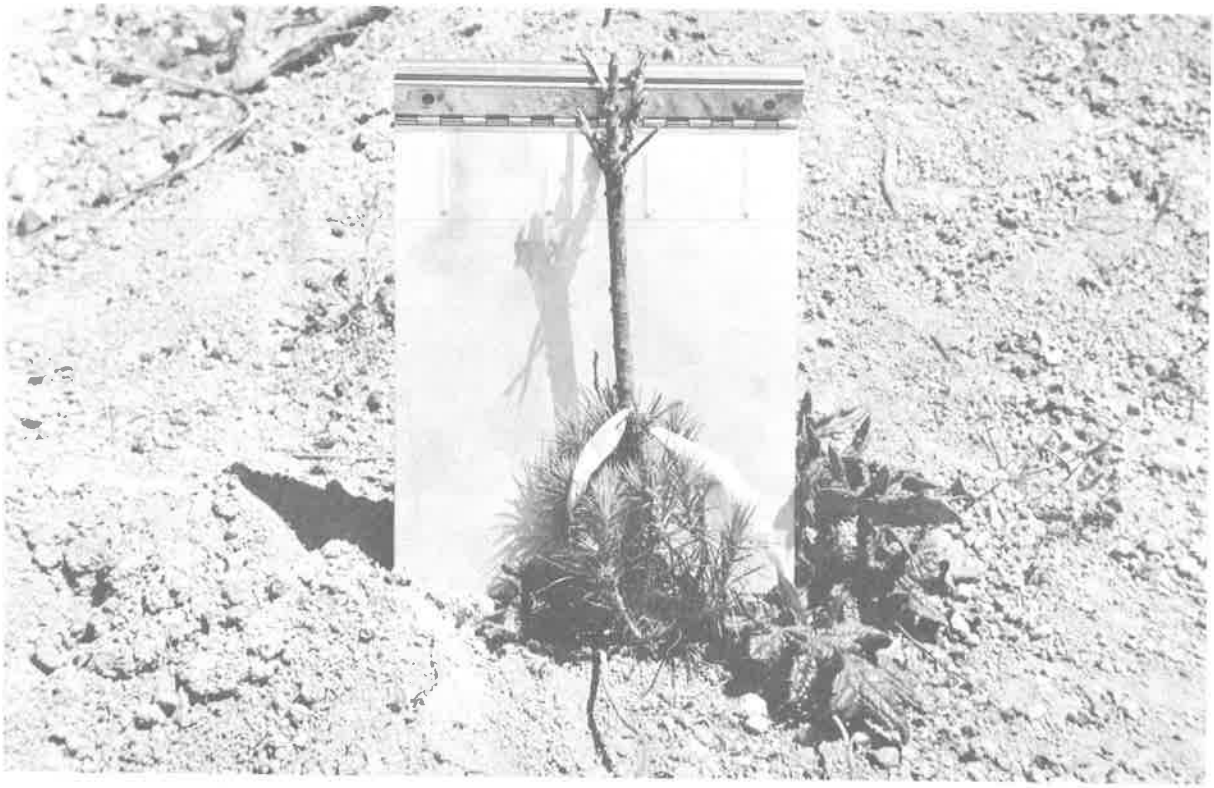
Lower elevations should receive fertilizer in the spring and higher elevations in late spring (after snowmelt).

Rodent Control

Most Christmas tree projects will probably be located in the member's backyard or in a field near his house so that rodent control probably won't be much of a worry. If there are rodent problems we suggest using a trap to exterminate them. Because of the project's location and the member's age, using poison to control rodents is not advisable. Consult your County Agricultural Commissioner for the latest information on the proper use of bait and trap.

Animal Damage

Grazing animals or deer may heavily browse newly planted trees. Where necessary the planting area should be fenced.



Animals have heavily browsed this top forcing new growth at base.

Disease and Pest Control

Monterey pine is particularly susceptible to damage by **western gall rust** and **spider mites**. Thoroughly check the vicinity of the plantation for old gall-bearing trees before you plant Monterey pine. If you cannot destroy diseased trees or remove gall-bearing branches, serious gall formations will reduce the value of the plantation. Closely check any yellowing of the needles on Monterey pine for evidence of spider mites.

Western gall rust appears as a rounded gall on twigs and branches of Monterey pine and sometimes on the main stem. Orange-colored spores occur in the galls in spring or early summer and spread directly to other pines. Branches or twigs bearing the galls are deformed. The galls should be pruned out before sporulation in the spring and before they become too numerous. Old gall-bearing trees in the vicinity should be pruned or destroyed.

Spider mites cause by far the most serious damage to Monterey pines. The needle yellowing (rust color) is caused by removal of the juices by the mites. Each spring there should be a careful check to see whether mites are attacking the trees. This can be done by holding one hand under a side branch and shaking it vigorously with the other hand. Mites will appear as tiny, barely visible, moving objects. The color may be pink, red, or green. If 5 to 10 mites appear from one shaking operation or if rust colored needles (tiny green flecks can be seen where the juices have not been removed) appear on the trees, they should be sprayed. Use Kelthane®* (emulsifiable concentrate, 1.5 lb/gal) at the rate of 2 teaspoons per 1 gallon of water.

Christmas tree size Sierra redwoods have shown little damage from insects or disease. If damage occurs, the cause should be identified before any control measures are taken.

Trials

If you would like to have your members conduct experiments on various aspects of Christmas tree growth you can set up trials for any one of these subjects: fertilizing, pruning, watering, shading, shearing, seed stratification.

*® = Registered trademark.

III

GROWING CHRISTMAS TREES FROM SEED

Getting Seed

It doesn't cost much, and it isn't hard to grow Christmas trees from seed. You can collect your own seed if you are near a Monterey pine or a Sierra redwood and can find enough cones from these trees. The 4-H Woodsman Manual obtainable from your University of California farm and home advisors' office tells how to collect cones and how to get the seeds from them. The information is on page 16 under "Growing Your 100 Trees."

Seed for growing Christmas trees can be bought from seed dealers.

The 4-H Christmas tree leader can order seed of either Monterey pine or Sierra redwood from these seed dealers:

- Forest Seeds of California - P.O. Box 561, Davis, California 95616
- Clyde Robin - P.O. Box 2091, Castro Valley, California 94546
- Kenneth O. Smith - P.O. Box 100, Magalia, California 95954

Order Monterey pine seed for the Monterey pine area (winter temperatures above 15 F) or Sierra redwood for areas with winter temperatures below 15 F.

The smallest quantity of seed that can be bought is 1 ounce. This amount of Monterey pine or Sierra redwood seeds can produce from 400 to 800 tree seedlings, taking into account the number of seeds in an ounce, and the chance for these seeds to germinate and grow. Each beginning member should try to produce 25 seedling trees, so 1 ounce of either kind of seed should be enough for up to 16 members.

What To Do With the Seed

Your members will want to get started as soon as you have gotten their seed. Have them understand that it is very rare to get 25 seedling trees from 25 seeds. Not every seed planted will sprout (germinate) and produce a tree. There are a number of reasons for this, but principally because no tree variety — pine, fir, redwood, etc. — produces only perfect seed from which 100 percent will sprout, and one variety — Sierra redwood — produces seed from which usually only 1 or 2 redwood seeds out of 10 will sprout.

There are several tests estimating how many seeds will sprout. They are also good indicators of how many seeds it will take to produce the 25 seedling trees the member hopes to grow. The easiest test (and the one we will use) is the **cutting test.**

Have each member count out 20 seeds at random from the seed supply and cut each one in half. Count the number of seeds (not halves) that are bright or light-colored, plump, and full. Some will be dark-colored, shrivelled, hollow, or may have insects or insect damage in the seed hull.

The bright, plump, healthy seeds are most likely to sprout and produce seedlings. We use the count of bright plump seeds to find the number of seeds needed to produce the seedling trees.

Don't be surprised if most, or all, of the Monterey pine seed looks good in the cutting test. Pine usually has a high sprouting

rate. Ninety percent or more good seed is quite common. Sierra redwood, however, is just the opposite. Ten to twenty percent good seed is usual.

To find how many seeds will be needed to produce 25 seedling trees, divide the number of bright seeds by the number of seeds cut. The decimal obtained is the percent of good seed in the sample. Then use the formula:

$$\frac{1}{\text{percent of good seed}} = \frac{\times}{25}$$

$\times$ = number of seeds to plant.

Example: 5 good seeds $= \frac{5}{20} = .25$

$$\frac{1}{.25} = \frac{\times}{25}$$

$$.25 \times = 25$$

$$\times = 100$$

The answer is the number of seeds needed to produce 25 seedling trees. When the count of bright seed is low (less than 10) as it may be in Sierra redwood it's a good idea to add extra seed to insure enough trees. To be on the safe side, increase the number of redwood seeds by 50 percent. For example, if your calculations show you need 125 redwood seeds, add another 63 (50% of 125) and plant 188 to be certain of 25 redwood seedlings.

How To Prepare Seed for Planting

Pine and redwood seed need a preliminary treatment before planting to increase sprouting. The treatment is called **stratification** and duplicates the natural winter time conditions in the forest that awaken the seed and help it sprout in the spring.

To stratify the seeds, place them in a tough, polyethylene bag. Add enough clean tap water to just cover the seed, and close the bag so the water won't run out. Keep the bag with the seeds and water in it, in a cold place (DON'T let it freeze) for a day and a half to soak the seeds thoroughly.

Drain off the water at the end of the soaking period, and then partly close the bag, leaving an opening of ½ inch to allow air to freely circulate in and out of the bag. Place the bag in the cold (35 F to 40 F) section of your refrigerator (NOT in the freezer section) and hold it there for 4 weeks before planting.

Planting the Prepared Seed

The best time to plant prepared (stratified) seed is in the spring. Seeds can be started at other times of the year, but they require special care and conditions to successfully start growth.

Your members can start their seeds in gallon cans (3-pound or 2-pound coffee cans could be used, too), or, if they wish, in a nursery bed. The directions for growing seed in nursery beds are given in the California 4-H Woodsman Manual, beginning on page 18.

If they elect to start their seeds in cans, have them prepare a potting mix using ⅓ find sand, ⅓ red sphagnum peat moss, and ⅓ garden loam soil, which should be thoroughly mixed. For good drainage, the cans should have holes in the bottoms. They'll need 10 to 15 cans for starting their seeds — more if they plan to grow all of their trees in containers. Fill each can ¾ full of the prepared potting mix and firm down gently. Divide the seed into about equal piles,

as many as there are cans. Scatter the seed evenly in the cans; cover the seed with about a ⅛-inch layer of the prepared potting mix and press it down firmly around the seeds.

Water the cans well, filling and refilling several times to saturate the soil. Place the cans in a warm sunny location out-of-doors.

Water the cans frequently, but lightly, with a light mist spray. Keep the top inch of soil from drying out, but don't wash the soil around with the water. Watering only in the morning will prevent some damping off (seedling death shortly after sprouting).

What To Do With the Seedlings

If everything is going well for your members, many seeds will have sprouted and seedling plants have pushed up out of the soil. Probably some cans will have many seedlings, while others have none. It's a good idea to transplant seedlings from those cans containing more than 4 or 5 plants to those cans having fewer, and to space plants equally in the cans. Transplant the seedlings when they reach 1½ to 2 inches in height. Separate the plants growing close together being careful not to damage the roots. The roots must stay moist when transplanting. The holes must be large enough so the transplanted roots won't be cramped or twisted and bent. Press the soil down firmly around roots of the transplant and water well.

Water the cans whenever needed, avoiding both overwatering and drying out.

When the seedlings reach 4 to 5 inches high, it's time to transplant again. This time, they should be replanted — one seedling tree to a can. Follow the transplanting instructions already given — with this addition: trim the main root so that it is about two-thirds of the length of the above-ground stem, and nip in lateral (or side) roots so that they are not as long as the main root. Replant so that the roots are not twisted or bent, firm the soil around the roots and water well.

The seedlings may remain in gallon cans until they are 1 to 1½ feet high before they are transplanted to larger containers or into Christmas tree plots.

IV

TREE GROWTH

Rate of Growth

Growth rate is important in any Christmas tree venture. 4-H foresters will find Monterey pine is the fastest growing Christmas tree sold in California. Although Sierra redwood is somewhat slower, with good management on good soils it will produce a 6-foot tree in 4 to 5 years.

Branch Whorls

Both trees differ from other pines and firs by producing several branch whorls throughout the year. After the first year in the field, Monterey pine and Sierra redwood may produce as many as three whorls of branches and grow 3 or more feet in height in a year. Their rapid, bushy growth is the reason these two trees are the mainstay of the California choose-and-cut Christmas tree business.

An ideal Christmas tree has branch whorls every 10 to 12 inches, grows rapidly, maintains a narrow cone shape, and has a fresh healthy appearance. Since this doesn't always happen, the tree's growth needs the help of shaping and shearing of leader and side branches.

Buds and Needles

In Monterey pines and Sierra redwood, height and side growth occurs from young cells in the buds at the ends of the main stem and side branches. During the dormant season, buds of Monterey pine appear as brown "pencil eraser" type growth at the tips of the leader and side branches. When new growth appears in early spring, the brown buds begin to elongate and the tips take on a candle-like appearance with tiny short needles and needle bundles occurring as the length of growth increases. The needles continue to grow until they equal the length of last year's needles. In warm climates when the trees are irrigated, candle-like growth may continue until late fall. This continuous growth feature makes Monterey pine unique as a Christmas tree and accounts for the rapid height growth.

Unlike Monterey pine, Sierra redwood buds are not covered by brown scales but are exposed at the tips of the leader and branches. The growing point looks very much like the other scale-like needles on the tree. The young cells at the tips elongate and produce whorls and branchlets with more scale-like needles. In warm climates when the trees are irrigated, growth may continue until early fall.

Roots

The roots of these two trees serve as anchors to hold the tree upright. They also transport water and nutrients from the soil to the needles where food is manufactured for the tree's growth. The rapid-growing Monterey pine may blow over during windy and wet soil conditions. This requires straightening and packing the soil around the stem to maintain an upright position. Sierra redwood roots are heavily damaged by the lack of air in wet soils and the seedlings do not normally survive.

Monterey Pine *(Pinus radiata)*

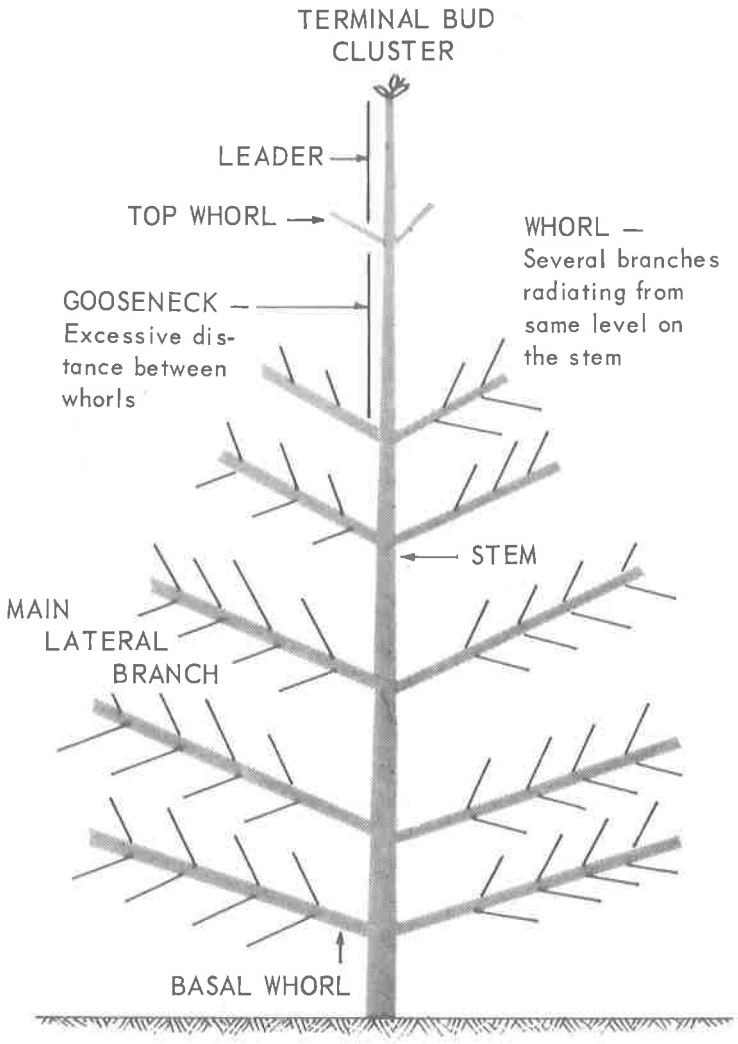
Height 40-100' — for general forestry and Christmas trees. Native of the central coast region of California. Needles are in twos and threes, dark green, 4 to 6" long. Rate of growth from 2 to 4' per year. Requires a moist climate for maximum growth. May not stand temperatures below 15 F.

Sierra Redwood *(Sequoiadendron giganteum)*.

Height 150-300' — for Christmas trees and general forestry. Native of the central Sierra Nevada. Leaves scalelike. Rate of growth from 1 to 3' per year. Grows well in most mountainous areas on moist, well-drained sites, in elevations up to 8,000'. Cannot withstand temperatures below -5 F.

V

TREE TERMINOLOGY



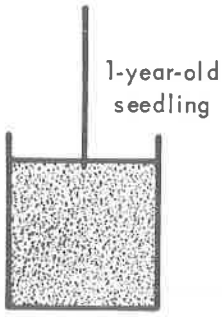
Monterey pine Christmas tree terminology.

VI

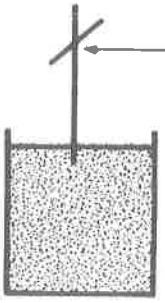
SHEARING TECHNIQUES

Monterey Pine

In Gallon Cans

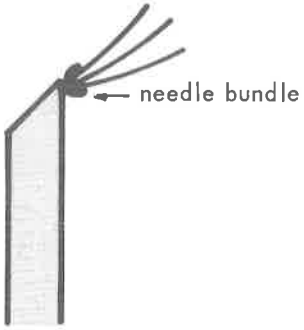


(1)

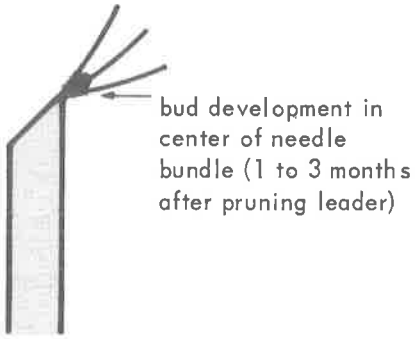


(2)

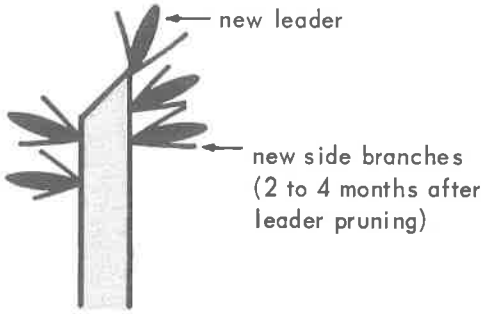
(3)



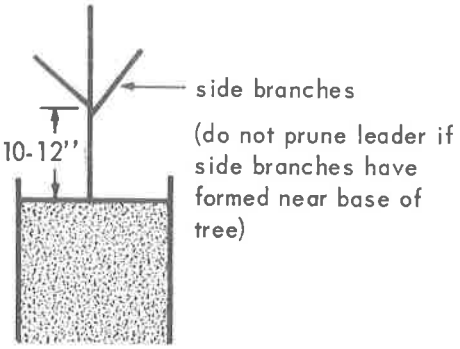
(4)



(5)



(6)



(7)

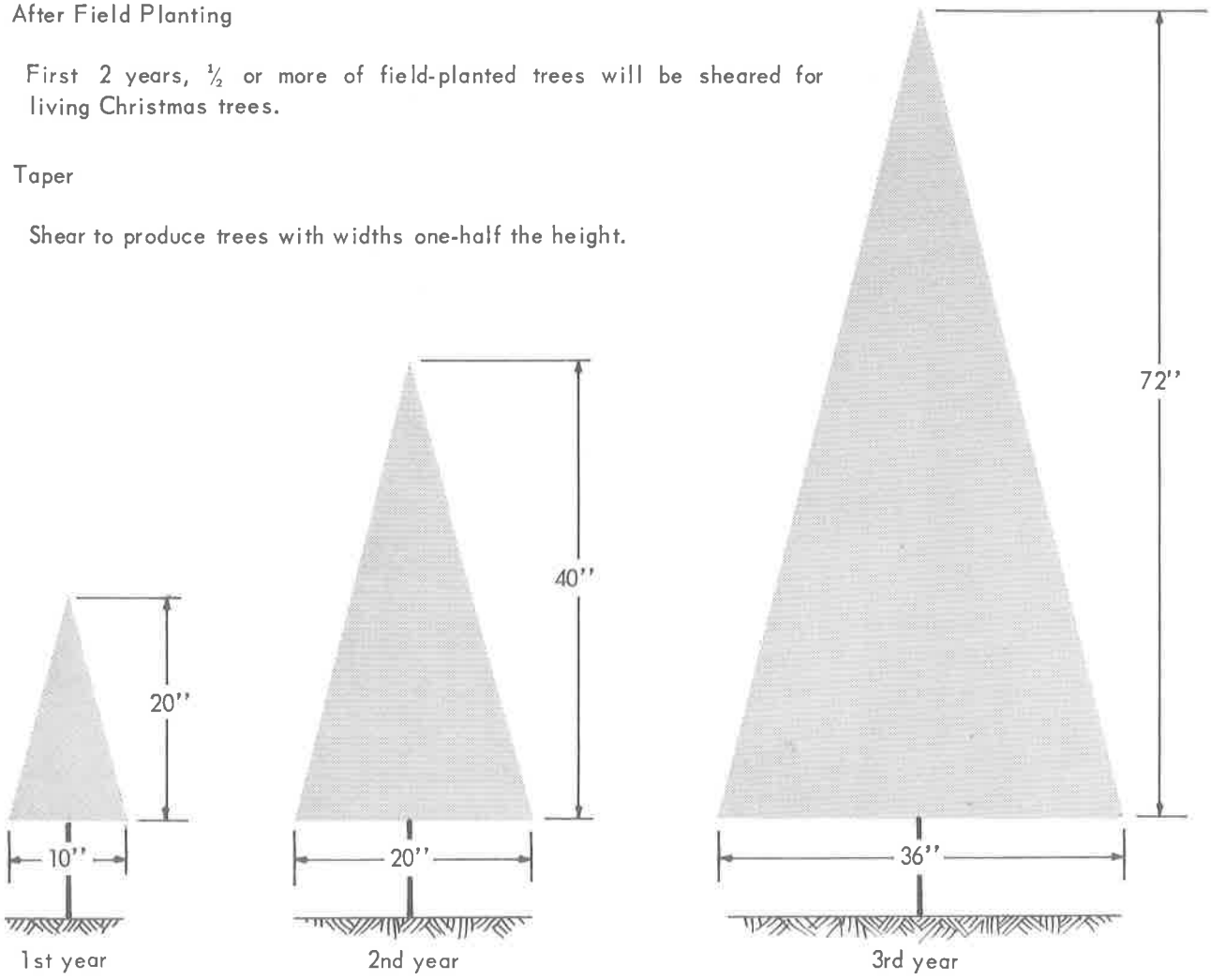
Living Christmas Trees

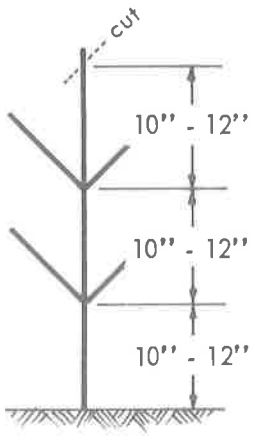
After Field Planting

First 2 years, ½ or more of field-planted trees will be sheared for living Christmas trees.

Taper

Shear to produce trees with widths one-half the height.





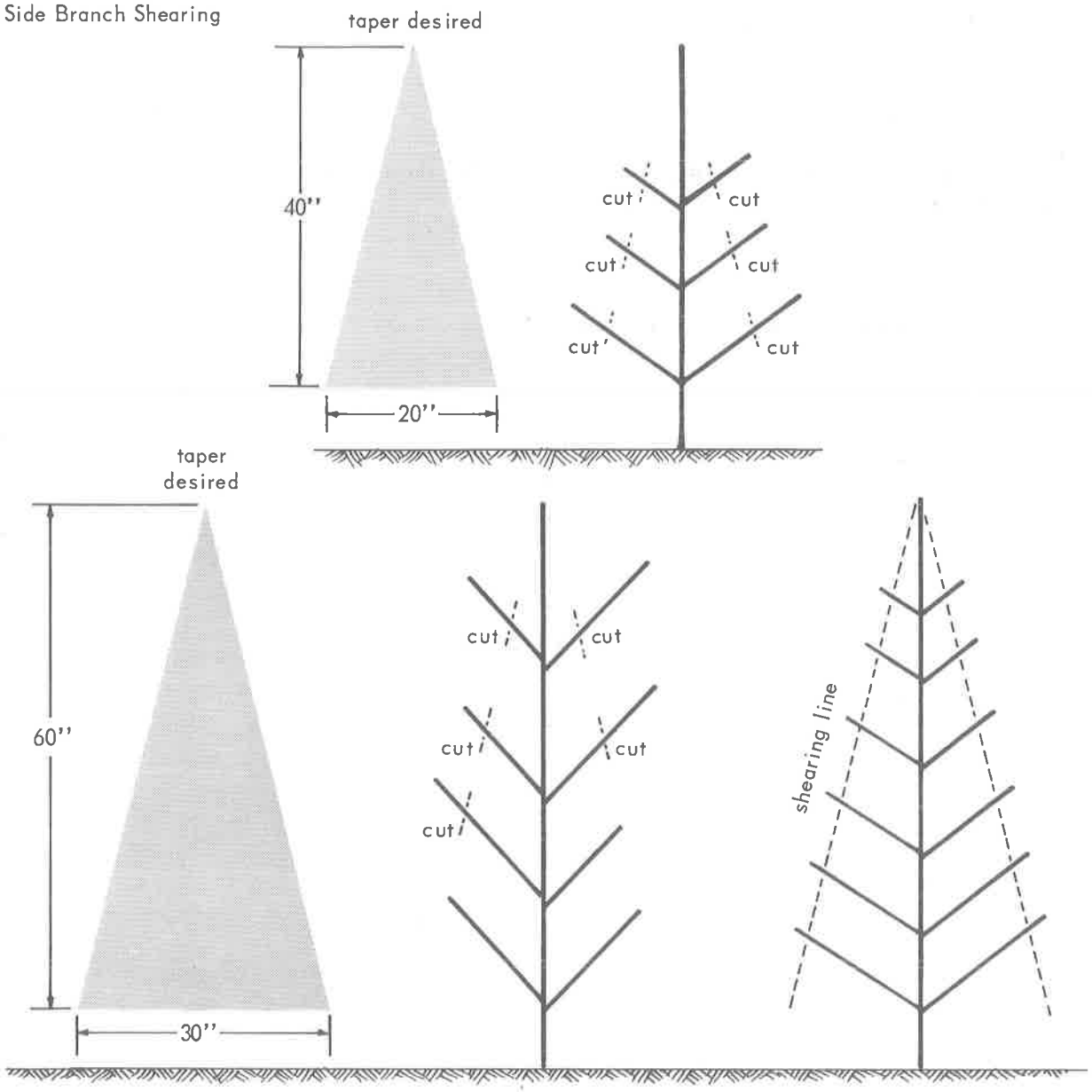
Leader Shearing

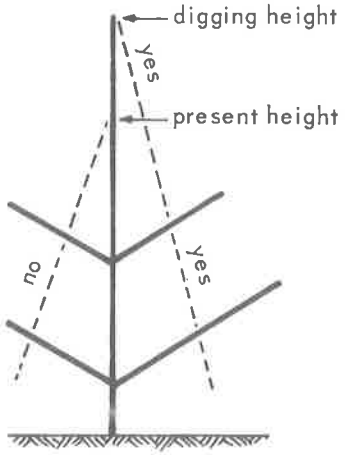
Use knife or hand shears to maintain leader length at 12 inches or less. Make a 45° angle cut as shown in shearing in gallon cans.

(REMEMBER: Whenever a cut is made 1 to 3 months are needed to produce a new leader.)

Watch trees closely and if leader becomes 12 inches long without producing side branches make a 45° angle cut on leader.

Side Branch Shearing





Steps

1. Maintain 50% taper (tree base or width one-half the height). Example: 4-foot height equals 2-foot base.

2. Make cut on side branches when branch extends beyond shearing line. Top whorl side branches should be three-fourths the length of leader.

3. Shearing line of a living Christmas tree should run from the anticipated height of leader at the time of digging rather than present leader height.

4. Most living trees will be sold at heights of from 3 to 6 feet.

Choose-and-Cut Christmas Trees

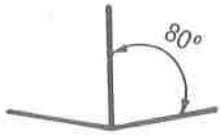
Taper (50%)

Same as for living Christmas trees.

Leader Shearing

Use knife or hand shears to maintain leader length at 12 to 16 inches. Trees producing branches with a sharp angle to the stem –

sharp angle



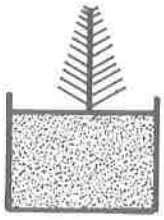
flat angle

can be allowed a leader longer than 16 inches.

Side Branch Shearing

1. Follow steps for living Christmas tree.
2. Most choose-and-cut trees will be sold from 6 to 7 feet in height. Top of shearing line should always be at 6 or 7 feet.

SHEARING SIERRA REDWOOD



In Gallon Cans

(This tree makes an excellent living or choose-and-cut Christmas tree.)

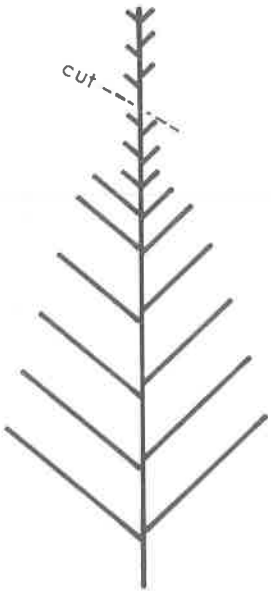
Redwoods develop a bushy appearance and require little shearing before the end of the first year in cans.

After Field Planting

The first year after field planting no leader or side-branch shearing will be needed. Normal growth habits are similar to the inverted-cone shape of most Christmas trees.

After two or more years in the field, side branches of redwoods may have sufficient growth so that heavy weight of branch tips will cause open spaces along main stem and wide taper. Side branches should then be sheared as in the method described under side-branch shearing for Monterey pines. Unlike Monterey pines, new buds do not form, but growth continues from uncut naked buds at tip of each small branchlet. This growth conforms to the shape in which the tree has been sheared.

The leader in a redwood develops with many small side branches. Often this growth is rapid and gives the top of the tree an open appearance. In this case the leader should be cut just above a small side branch. The small branch then turns up and becomes the main leader.



VII

SELLING CHRISTMAS TREES

Opportunities for the 4-H forester to sell Christmas trees are excellent. Although most cut Christmas trees are sold at 6 to 7 feet in height, a forester with marketing talents can be selling trees at the end of 1 year of growth.

Sale of 1-Year-Old Container Stock Growing in Gallon Cans

After 1 year of growth, most Monterey pines will be 10 to 12 inches in height and Sierra redwood will be 6 to 8 inches in height. These trees can be sold to homeowners for ornamental plantings or Christmas tree plantings. Often commercial Christmas tree farmers plant trees from gallon cans and are in the market for large quantities of trees. Nurseries, farm stores, and other retail stores sell 1-year-old seedlings in containers. Other 4-H foresters may wish to get a head start on their Christmas tree project and purchase 1-year-old seedlings. An organized sales program by the club may also be effective.

Potential year-round buyers are:

- homeowners
- other Christmas tree growers
- nurseries, farm stores, and other retail stores
- other 4-H foresters

Tree seedlings obtained from the State Forest Nursery cannot be resold as container trees or living Christmas trees. This law pertains only to live trees and not to cut Christmas trees. Members planning to sell living trees should obtain seedlings from private tree nurseries or raise their own seedlings.

Sale of Living Christmas Trees 2 to 5 Years Old (Field Planted or Grown in 5-Gallon Cans)

Many Christmas tree purchasers prefer to buy a living tree at Christmas time that can later be planted in their yard. This requires the development of a healthy bushy tree. Shearing techniques are described under "Shearing Living Christmas Trees."

Living trees can be sold from 2 to 6 feet in height. Trees may be planted in 5-gallon cans or in the field. Trees in 5-gallon cans should be sold in their present container. Field-planted trees should be root-pruned at least 2 months before digging. A 10- to 12-inch spade, held upright, should be used to cut the roots in a circle around the tree. Normally, a circular ball 12 to 18 inches in diameter will give an adequate root system for replanting after the Christmas season. The ball of roots may be wrapped in burlap or placed directly in a metal, wood, plastic, or paper container.

Orders can be taken and sold direct to homeowners or to retail outlets.

Sale of Choose-and-Cut Christmas Trees

Trees that have not been sold as living trees can be developed for the choose-and-cut market. Trees from 5 to 7 feet tall can be produced in 3 to 5 years under good growing conditions.

If the forester has produced bushy healthy trees with an inverted-cone shape, he will have no difficulty in selling trees to friends and neighbors during the Christmas season.

During November, potential buyers should be made aware of the trees that are available. Following Thanksgiving, or an earlier date if he wishes, the buyer should be allowed to select and tag the tree he would like to harvest for Christmas. The selling price of the tree should be paid at the time of tagging.

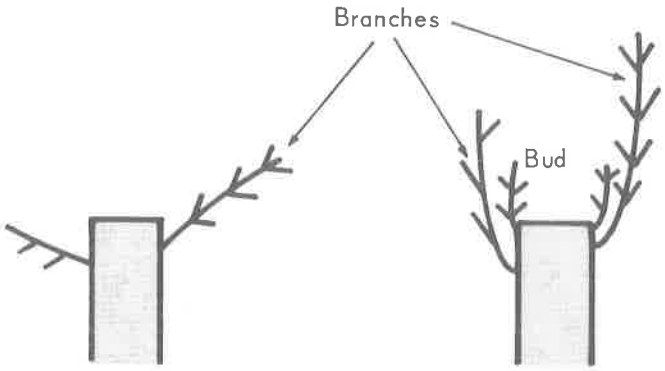
When the tree is cut, two or more branches should be left at the base of the stem for a turn-up tree. This will be the start of the next Christmas tree.

Turn-Ups

Branches left at the base of the stem (stump) of a cut tree are called turn-ups. These branches, or buds that develop from the stump and become the next tree, can under favorable conditions produce a tree in a shorter period than a planted bare-root seedling.

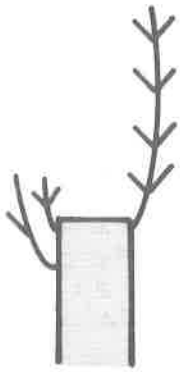
At least two or more live branches should be left near the ground line on the base of the stump. These branches or buds from the stump will turn upright in 6 months or less. When the branches or buds have turned upright, the one with the best Christmas tree characteristics should be selected. All other branch growth should be reduced to one-half or less of the size of the branch selected (main stem). This allows the main stem to gain dominance, while other branches continue to manufacture food for the growth of the tree.

The main stem now becomes the new Christmas tree and should be sheared the same as a tree that has been planted. Other branches should be kept small by pruning so as not to shade or interfere with the growth of the new tree.



Stump at time of harvest

Turn-ups (6 months later)



Main stem selected - other branches cut back

VIII

TOURS

Project Tours

There are two kinds of tours — project tours and industry tours. A **project tour** is a planned visit to all or some of the project member's plots by the other 4-H members and the project leader. Besides giving you a chance to see the progress being made by each member, it gives each member a chance to compare his work with that of his fellow members.

The desire all of us have for group approval will help all members to work a little harder preparing their projects to show.

It gives you a chance, too, to involve parents in helping with transportation, with refreshments or just being there when the group visits their boy's project.

Involve the members in planning the tour and making all the arrangements. Be sure the tour route is sensible and if very many stops are involved, time the travel between stops. Remember that if two or more cars are involved, maximum average speed will be about two-thirds the legal speed limit to prevent losing the following cars.

Arrange for members to evaluate the work done by fellow members. Have a critique of good and bad points observed (not using specific projects).

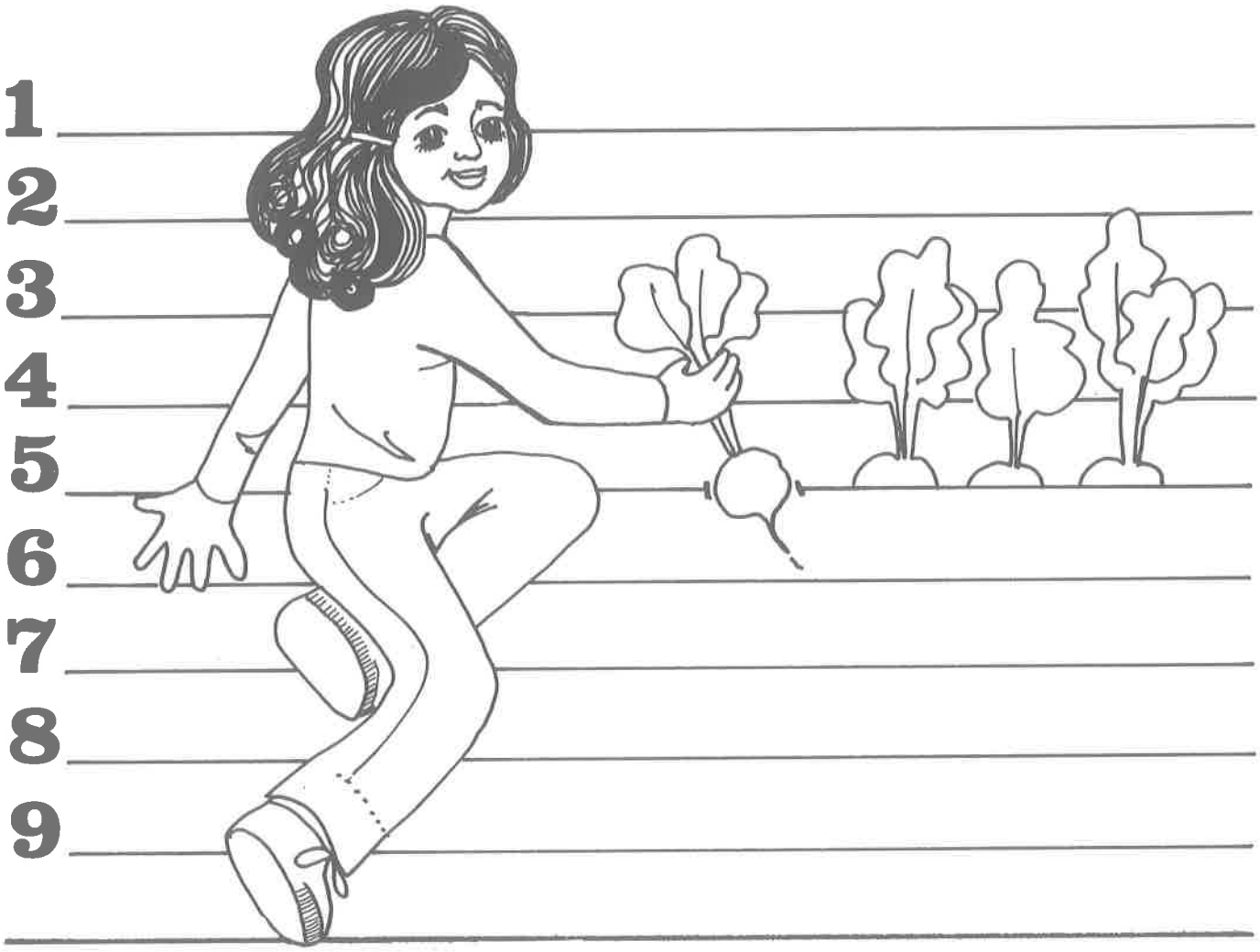
Wind up with refreshments and recreation if possible.

Industry Tours

Industry tours are easy to plan. Most Christmas tree growers, nurserymen, fertilizer plants and spray chemical plant operators are glad to help arrange for tours. Here again is a chance to involve parents in an activity with their children.

Visits can be planned to Christmas tree plantations, cut and sell operations in native stands, nurseries and manufacturing plants making materials used in growing trees. At Christmas time, commercial lots are a good place to tour, particularly to show grades of trees.

Tours are one of your best interest getters. Well planned, smoothly operating tours will add spice to the program and help your members to learn more about tree growing.



10 Easy Steps to a Young Person's Vegetable Garden

Cooperative Extension **University of California**
Division of Agriculture and Natural Resources

Leaflet 21185

Adapted by Joyce McReynolds from a Plowshare-Raja de Arado, San Diego, publication.
Illustrated by Kilian Garvey.

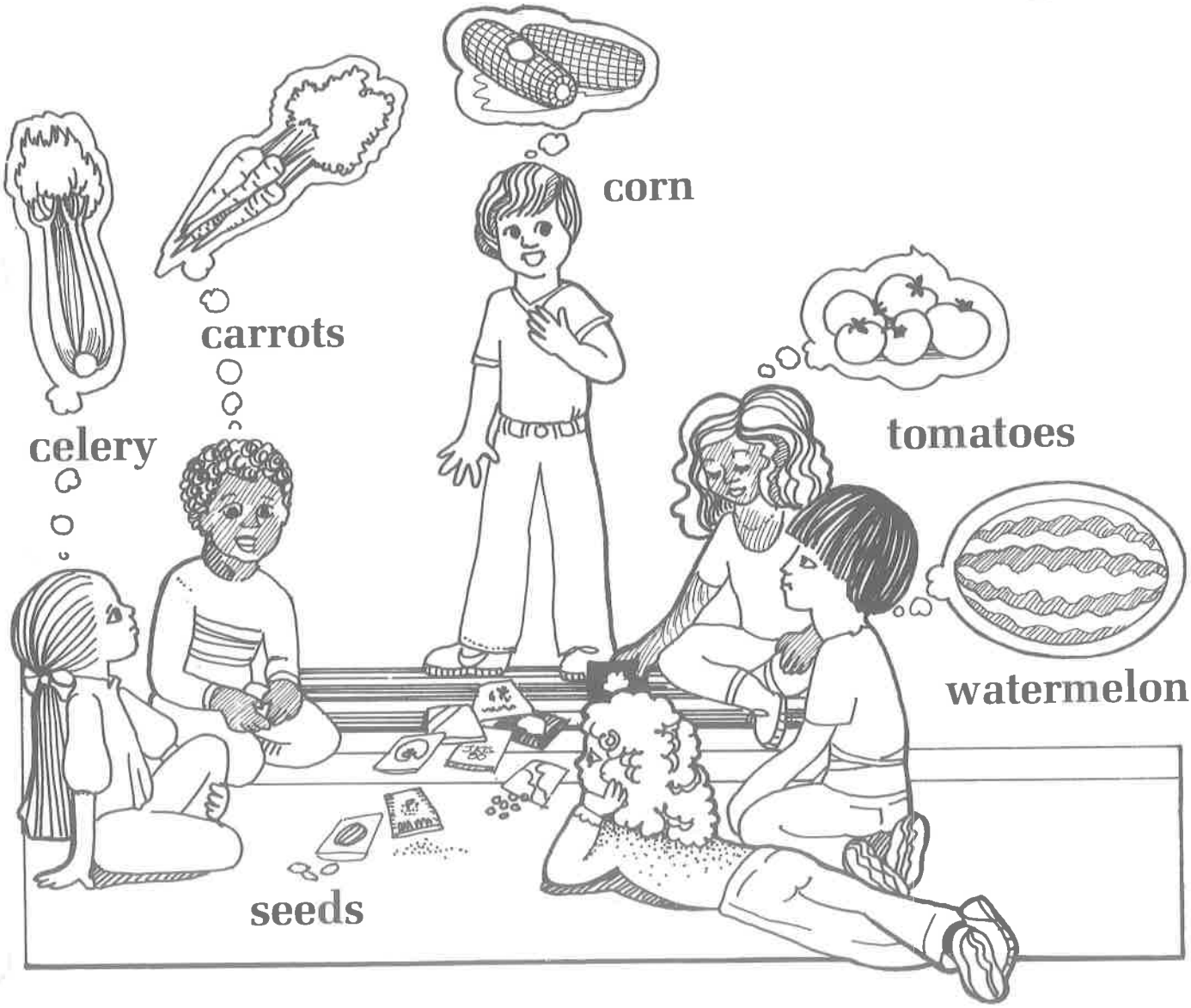
Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture, Kenneth R. Farrell, Director of Cooperative Extension, University of California.

1m-rep-4/92-JKM/KG-dsf

Planning

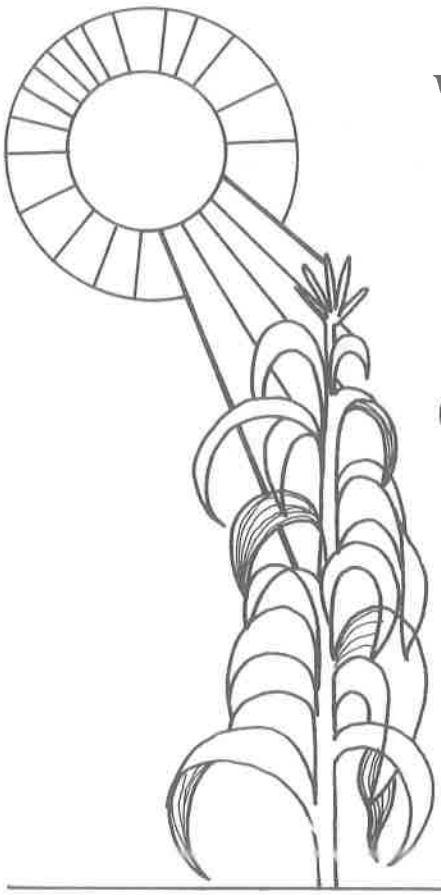
1

Decide which vegetables you would like to plant.



Things to think about:

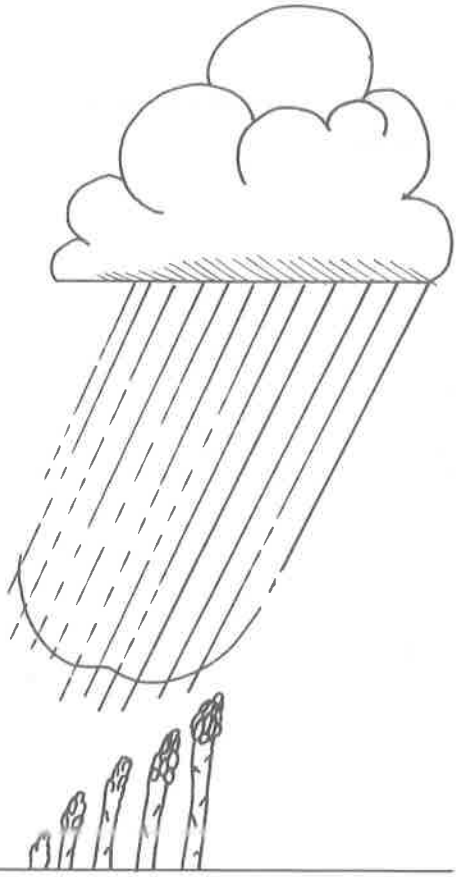
Which vegetables does your family like to eat?



What is the weather like where you live?

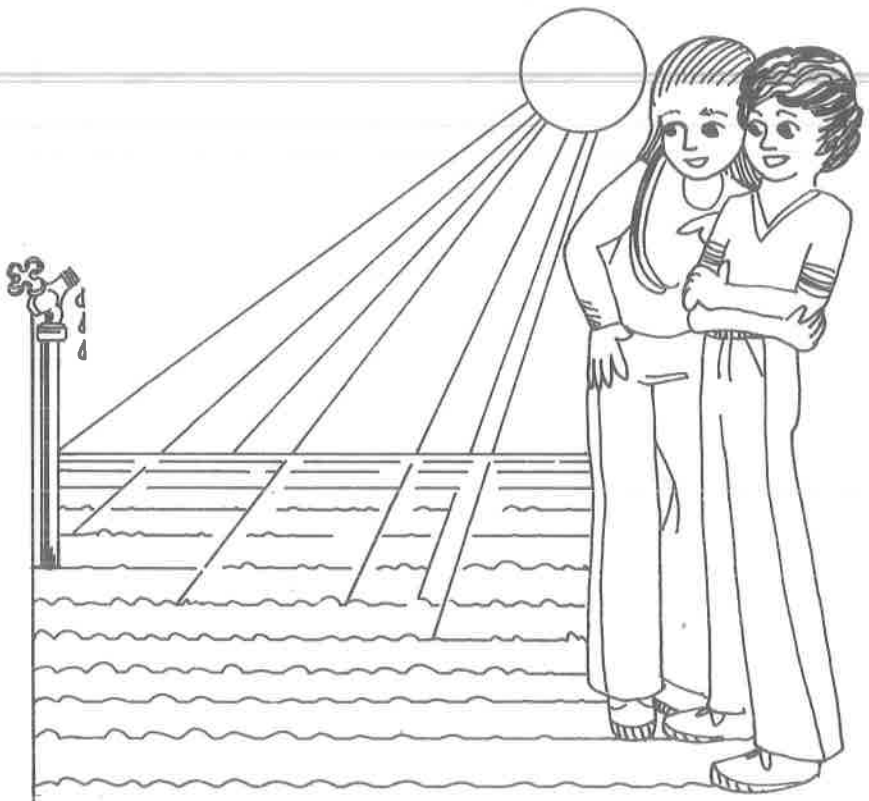
Some vegetables grow best in warm weather.

Others grow best in cool fall weather.



How much room do you have for your vegetables?

Read the information on the seed packets before buying.

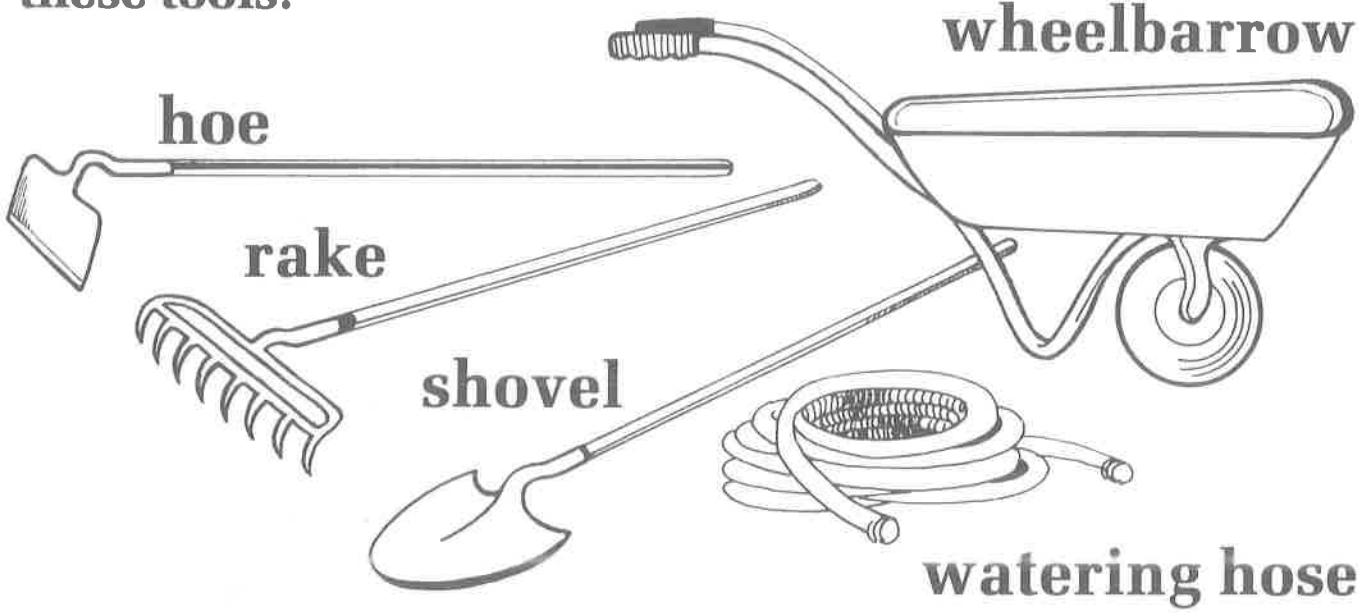


Find a place for your garden. Choose a flat piece of ground in a sunny place, with water near by.

Start with a small garden.

You can always make it bigger later on.

You will need these tools:



Preparing the Soil

2

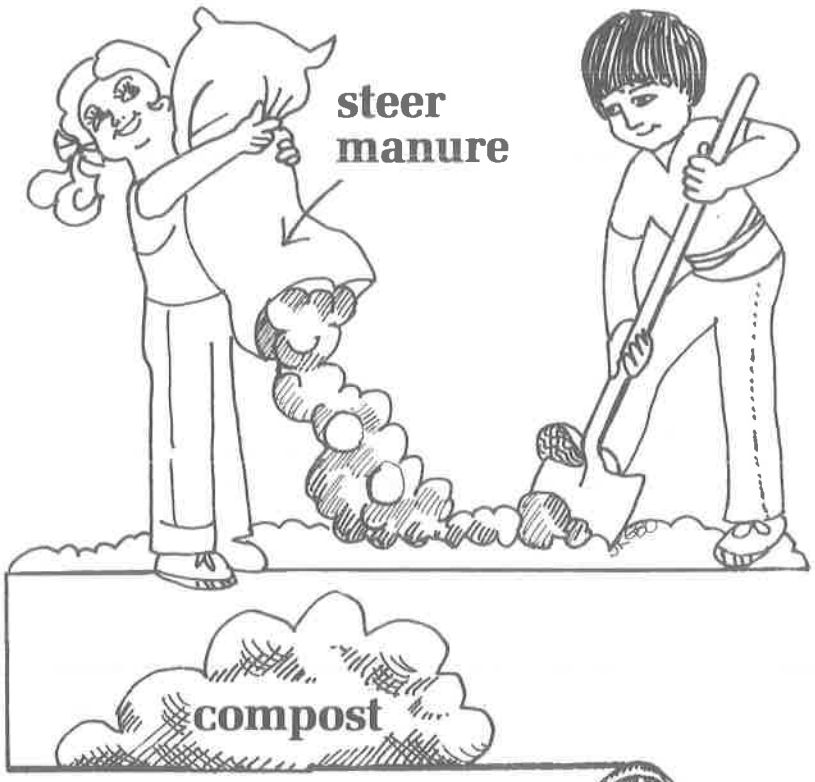
Dig the whole garden with the shovel when the soil is damp. Break up at least the top 6 inches of soil.

Don't dig when the soil is wet and sticky.

Pull out the weeds and their roots.

Remove all the big stones.

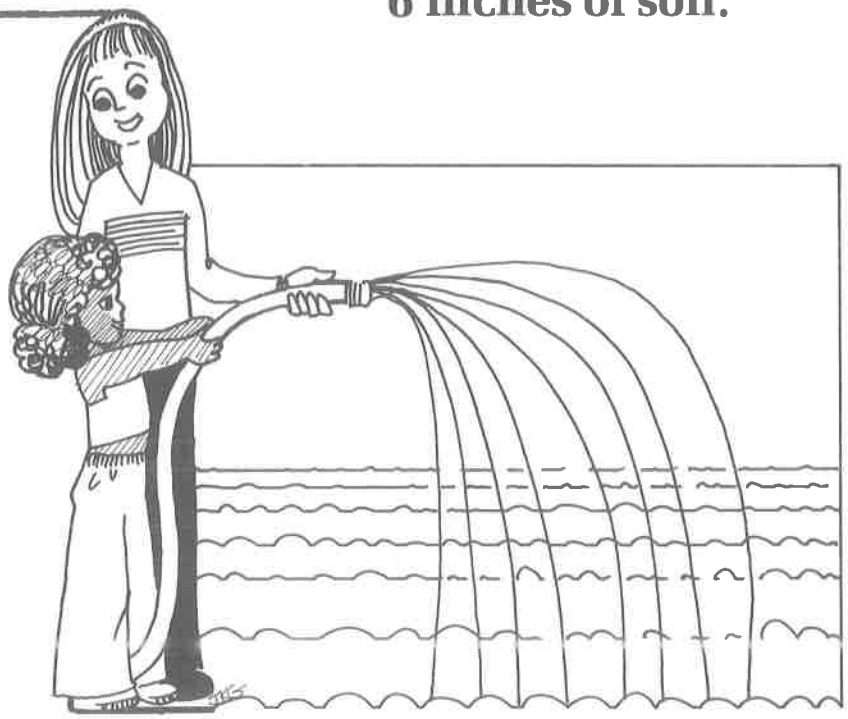
Fertilizing the Soil 3



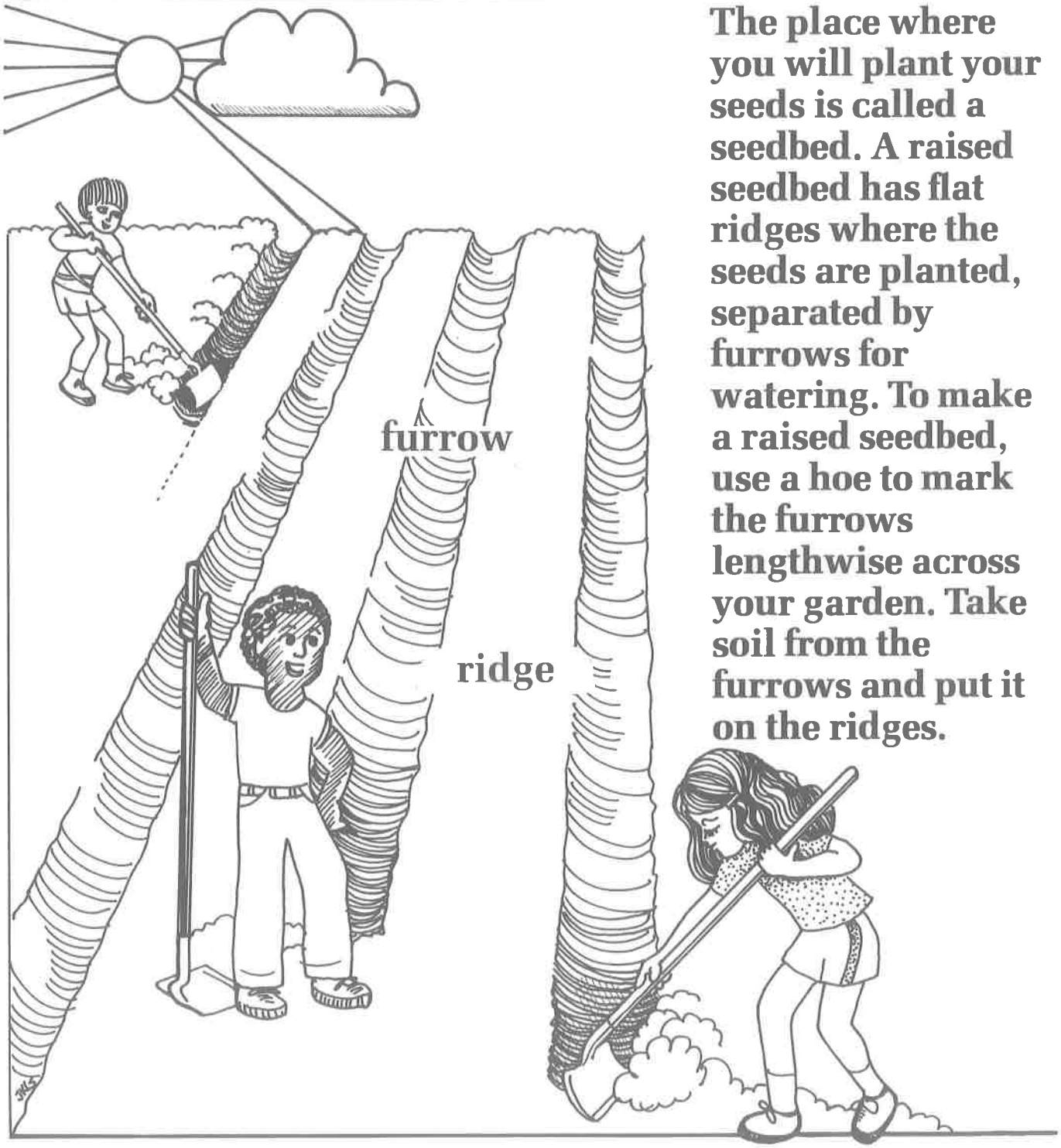
Fertilizer is the food we give to plants to make them grow well. Compost and manure are good fertilizers.

It is best to fertilize the soil before planting. Mix the fertilizer really well into the top 6 inches of soil.

Use 1 pound of manure for each square foot of garden. Then use the hose to water the soil. Wait 4 weeks before planting.



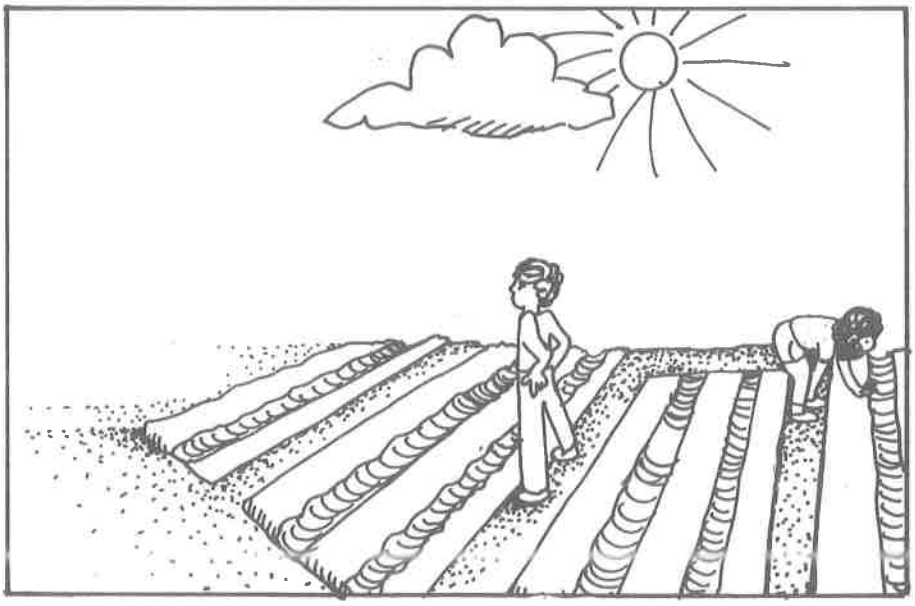
Preparing the Seedbed 4

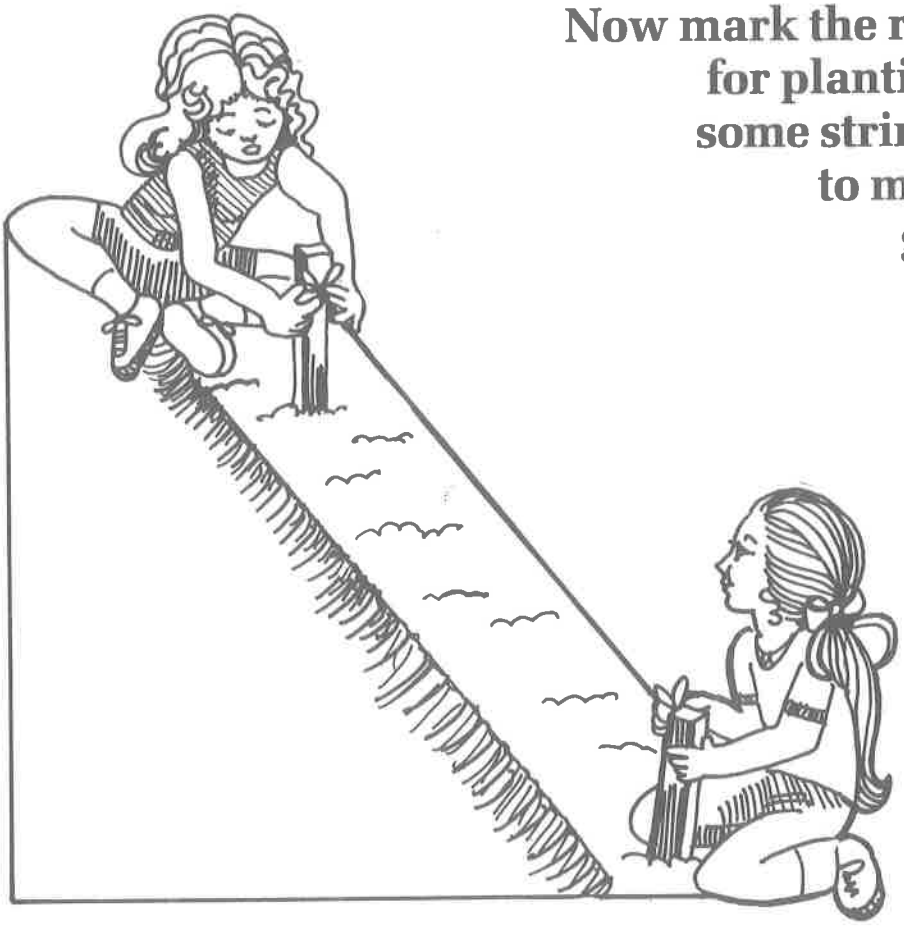


The place where you will plant your seeds is called a seedbed. A raised seedbed has flat ridges where the seeds are planted, separated by furrows for watering. To make a raised seedbed, use a hoe to mark the furrows lengthwise across your garden. Take soil from the furrows and put it on the ridges.

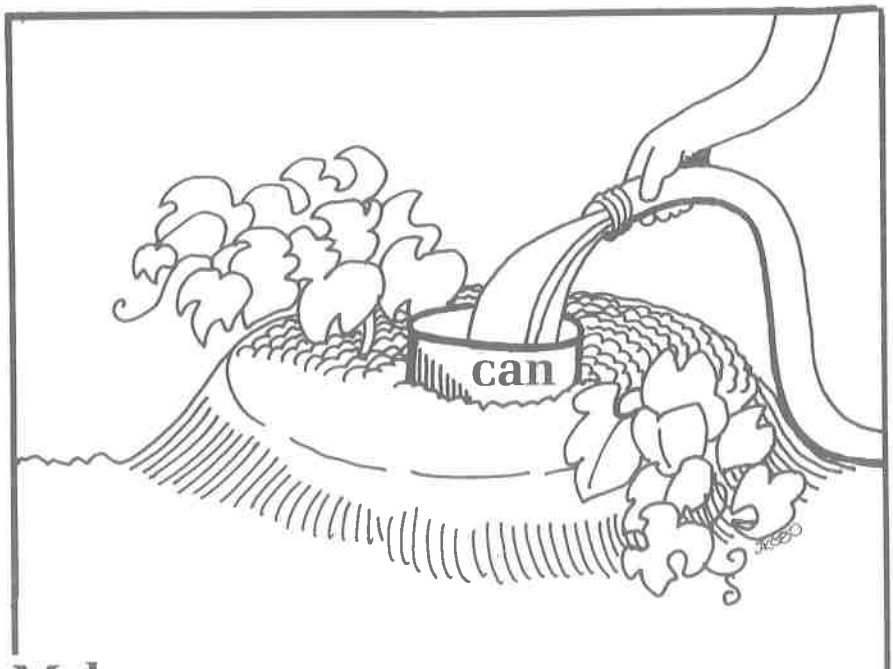
The tops of the ridges should be level. To make them level, use a flathead rake and push the soil backwards and forwards until the ridge is a little wider than the head of the rake.

When you make the ridges and furrows, remember that you need to leave space for a path. If you only walk on the path, the soil there will become compacted, while the soil in your seedbeds will stay light and in better condition for growing vegetables.





Now mark the rows along the ridges for planting the seeds. Stretch some string between two posts to make a straight line to guide you. For larger plants, mark only one row along the ridge. For smaller plants, you can mark two rows.

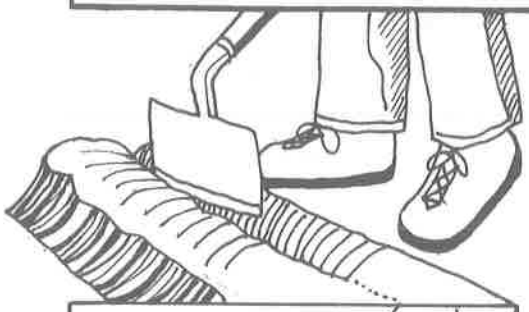


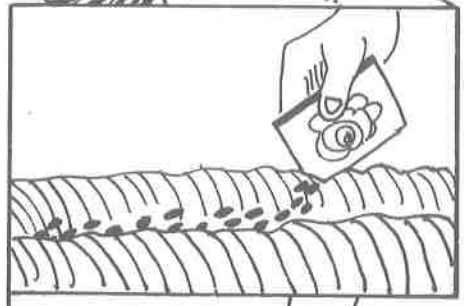
Melons grow very well in mounds.

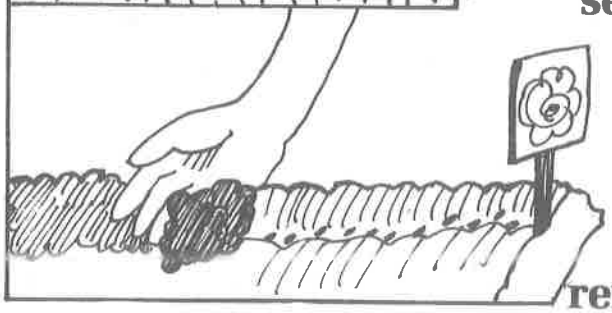
Seeds can also be planted in mounds of earth. Take a large tin can with the bottom and top cut out and put it in the middle of the mound. Plant your seeds around the mound, leaving enough space for them to grow. When you water your garden, direct the water into the can. This will stop the soil from being washed away.

Planting the Seeds 5

There are two ways to plant seeds. For larger seeds, you can make holes with your fingers using the string as a guide to keep the rows straight. Each seed will be a plant, so make the holes far enough apart so that the plants can grow without being crowded together. Follow the directions on the seed package for depth of planting. For smaller seeds, you can make a furrow one or two inches deep with the hoe and sprinkle a few seeds along the row. If you use this method, you will need to thin out the seedlings later to give your vegetables room to grow.







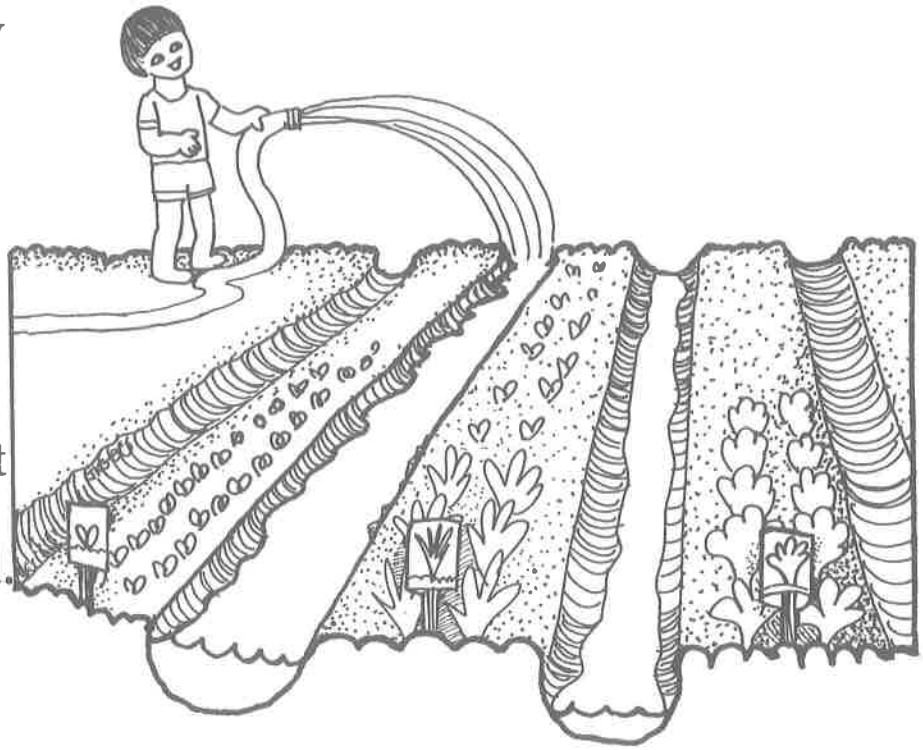
Cover the seeds lightly with soil and gently firm the soil around the seeds, being careful not to pack the soil too tightly.

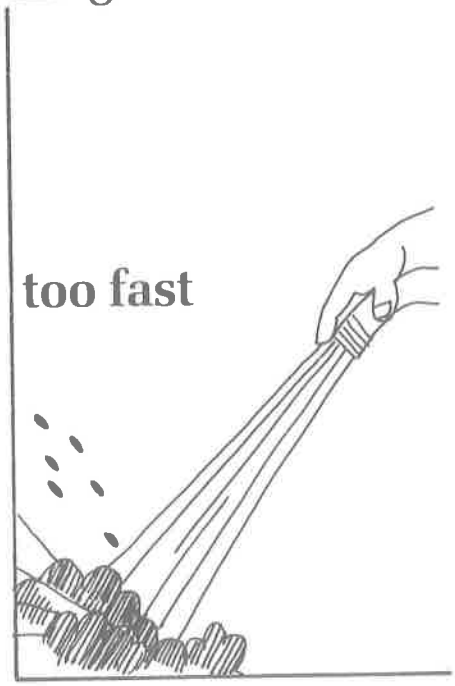
Attach the seed packet to a stake at one end of the row to remind you what you have planted.

Watering the Plants

6

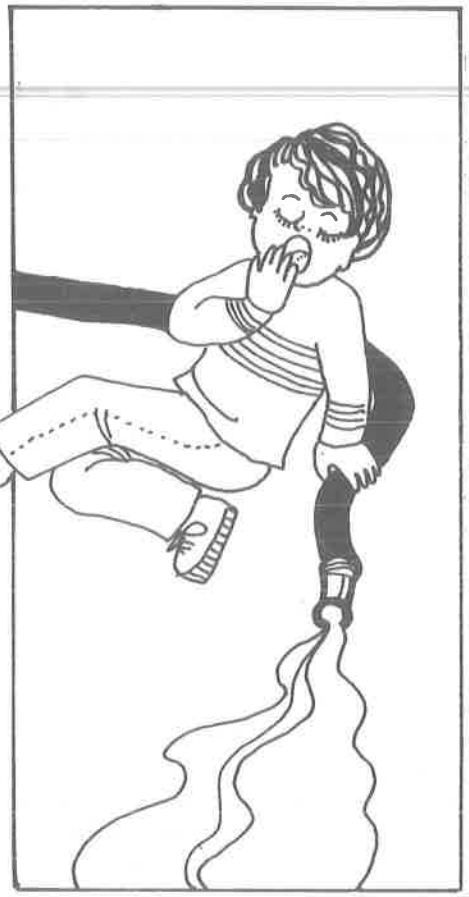
All plants need water to grow. They get water from the ground through their roots. So that they will have the water they need, you must wet the soil near the roots. Your plants will not grow well if you only wet the top soil. The water needs to soak into the ground.



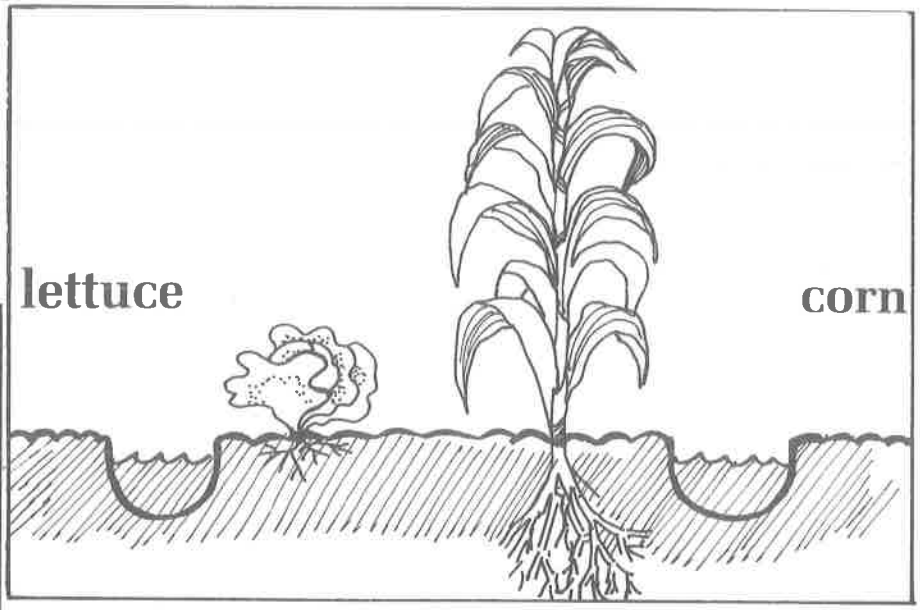


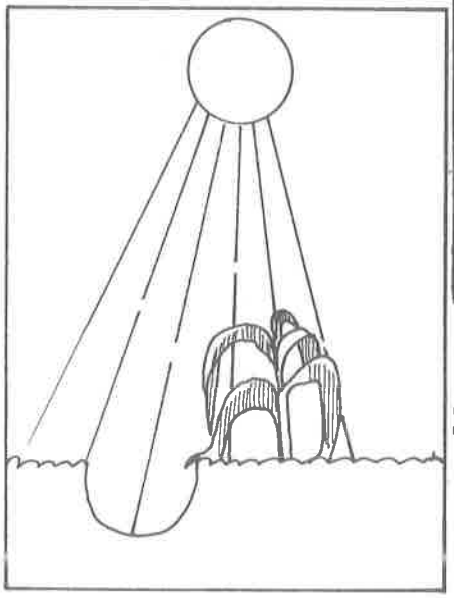
Connect the hose to the faucet and turn the water on very slowly so that there is just a trickle. If the water runs too fast, it will wash the soil and seeds away from your ridges. Direct the end of the hose into the first furrow, not onto the ridges where the seeds are planted. Wait until the water has half filled the whole furrow and then move on to the next furrow. To water more deeply, go back and start again after the water has soaked in.

Take your time!



Watering your garden cannot be done quickly. If you follow these directions, you won't have to water again for a few days. Water this way all summer, even when your plants get bigger. If you let the ground get dry, your plants will wrinkle and wilt and will not grow.



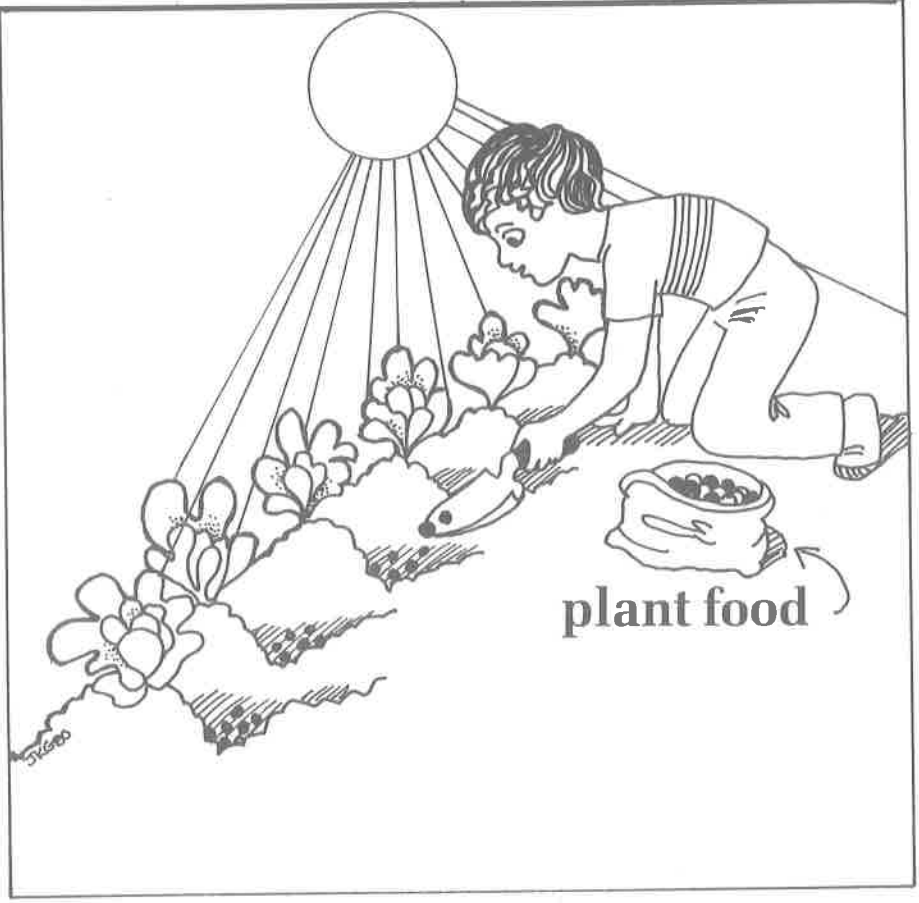


Smaller plants have smaller roots, so water less deeply but more often.

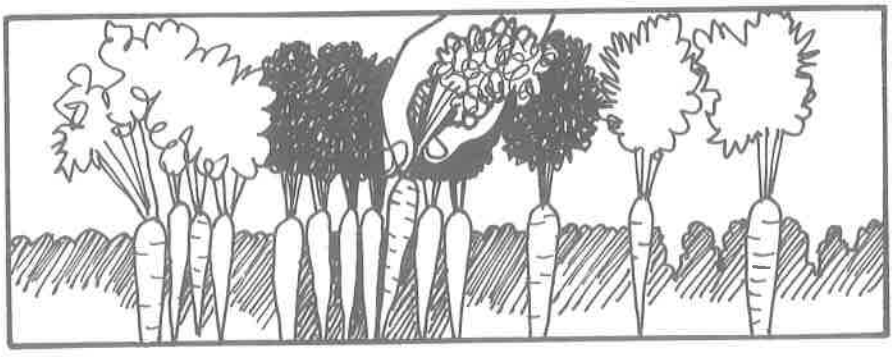
Larger plants have larger roots, so water more deeply.

As Your Plants Grow 7

Your vegetables may take 8 to 12 weeks to grow big enough to pick. As they get bigger, you can mix more plant food into the soil around them. Follow the instructions on the plant food packet.

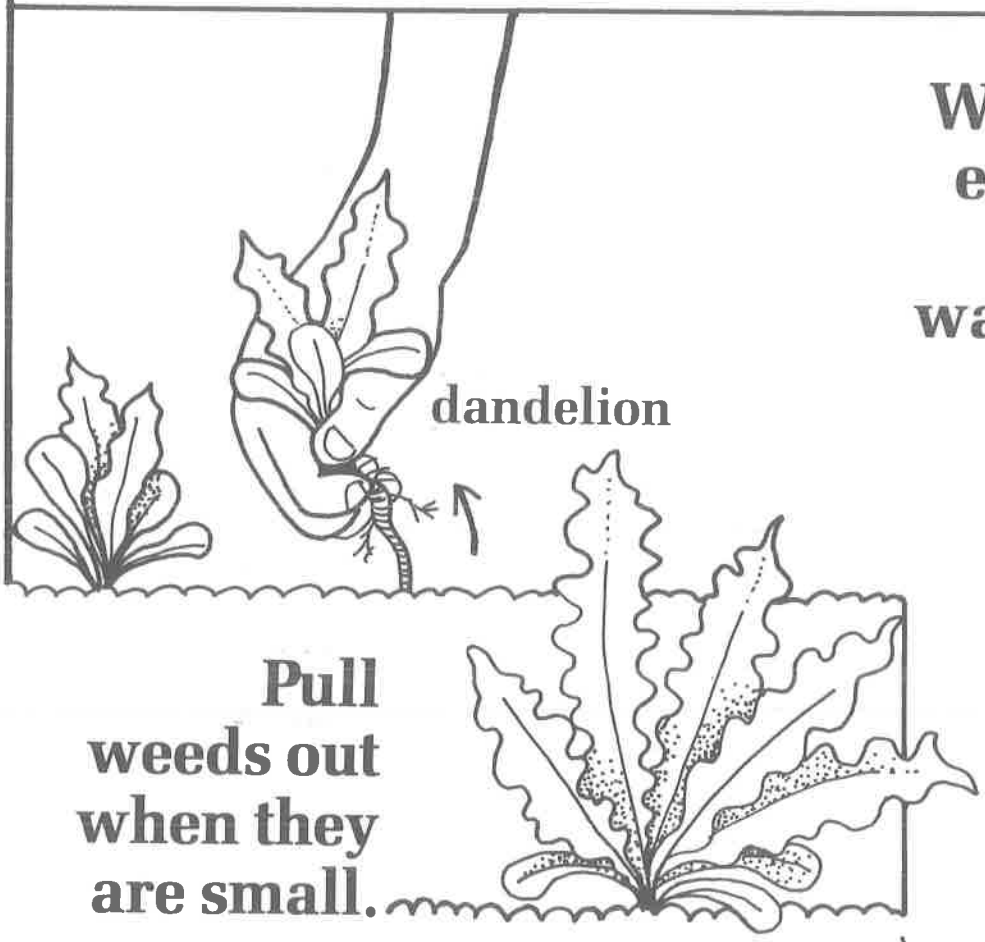


If you planted your seed by scattering along the row, you will need to thin out the plants as they get bigger. This means taking out the smaller plants so that the plants you leave will have room to grow. Some vegetables need more space than others. The seed packet will tell you how much space to leave between each plant.



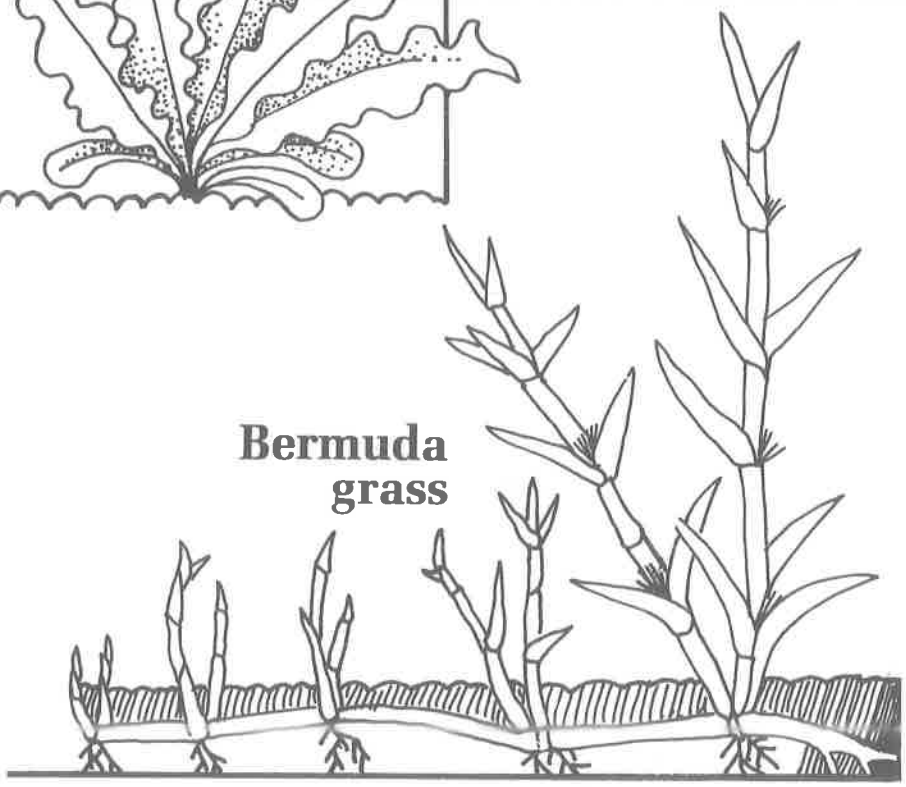
Weeds 8

Weeds grow in every garden. They take water and food away from your plants.



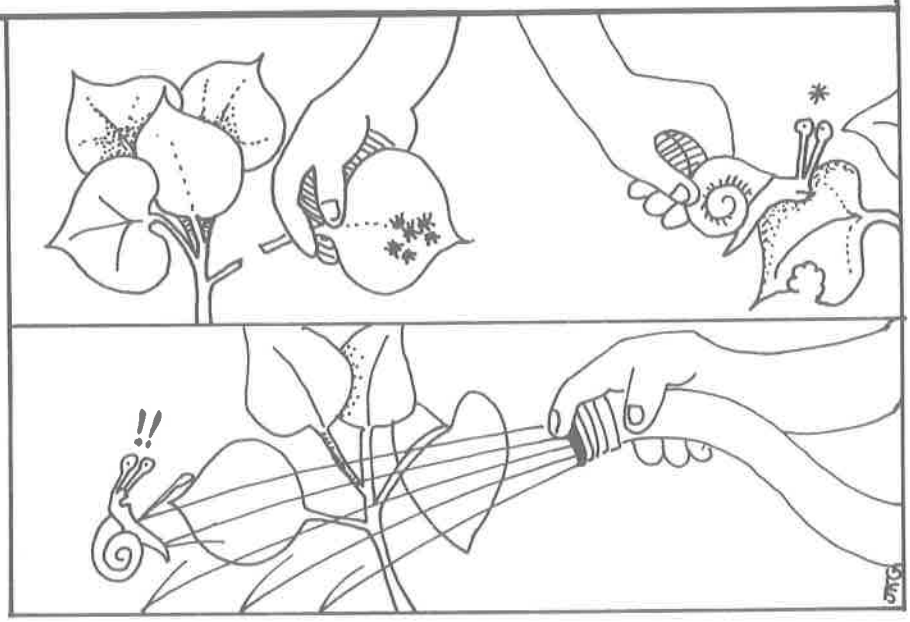
Pull weeds out when they are small.

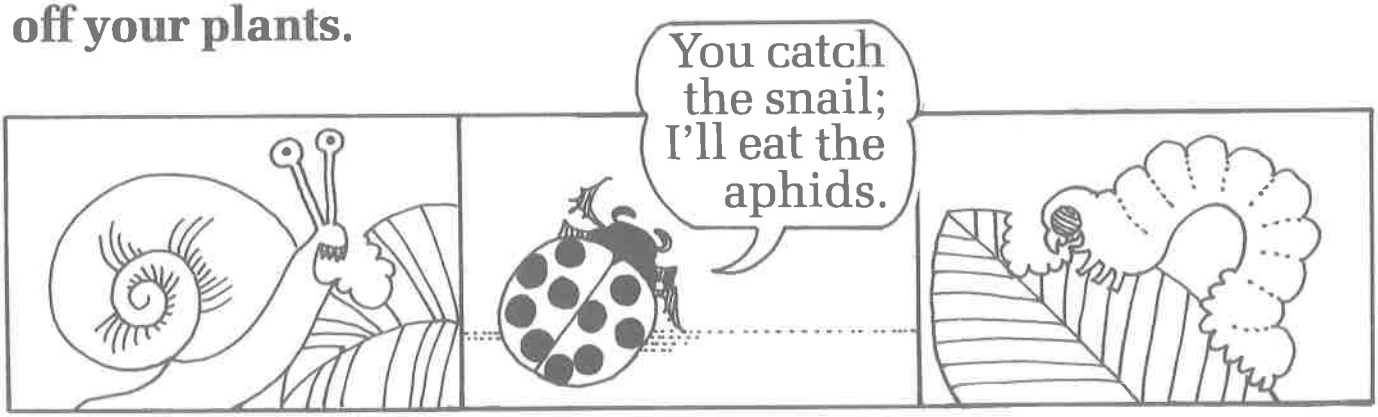
When you pull out Bermuda grass, be sure to remove all the roots. If you leave some roots, the grass will grow back again.



Garden Pests 9

Every gardener has problems with pests. Pick larger pests, like snails, from the plants by hand. If insects are all on one leaf, pick the leaf and throw it away before the insects have a chance to spread. A strong jet of water can also be used to wash many insects off your plants.



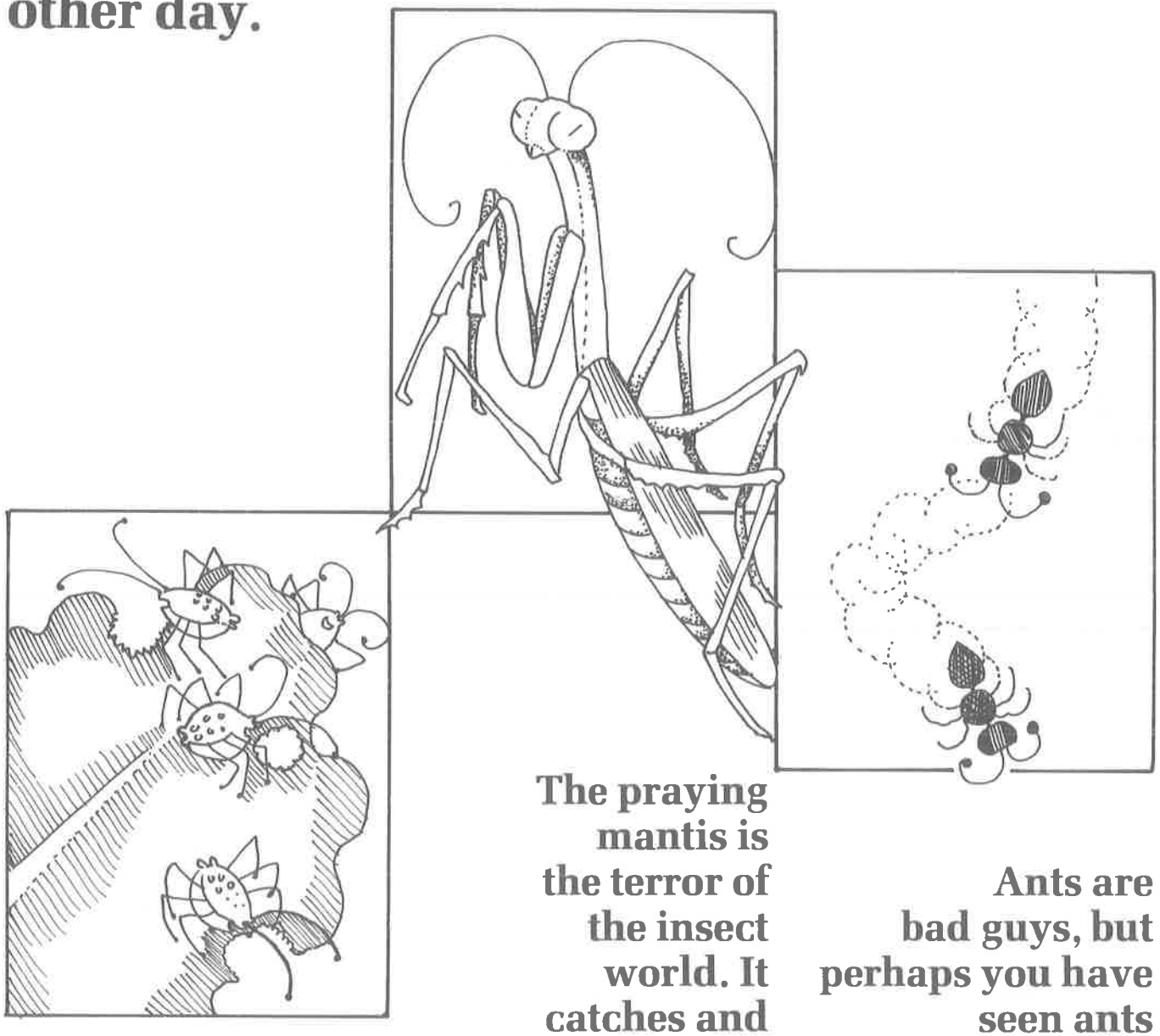


A bad guy: the snail.

The ladybug is a good guy.

The cabbage looper is a bad guy. He is green.

To control pests, inspect your plants every other day.



The aphid is a bad guy.

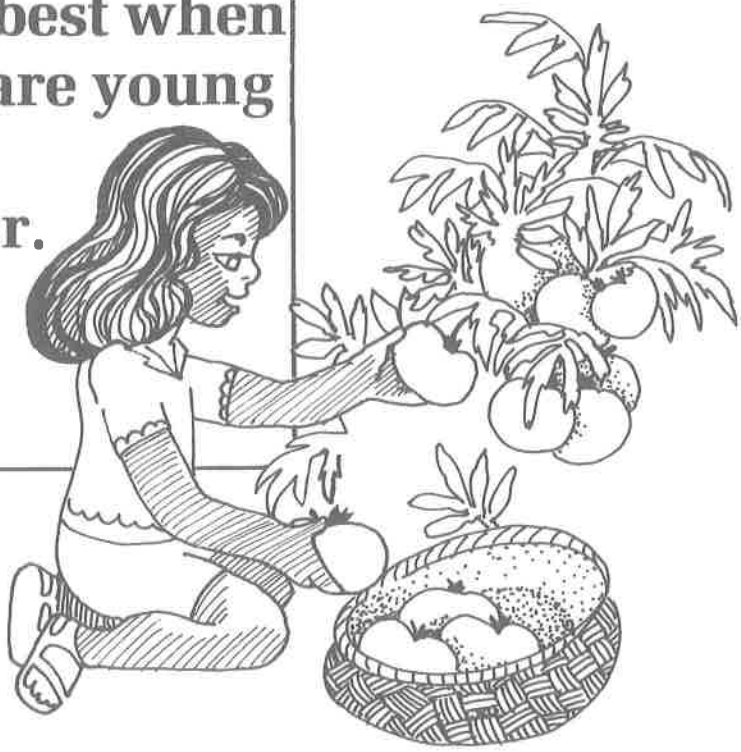
The praying mantis is the terror of the insect world. It catches and eats nearly all the insects it finds. The praying mantis is a good guy.

Ants are bad guys, but perhaps you have seen ants cleaning up garbage from your garden and taking it to their nests.

Harvesting Your Garden

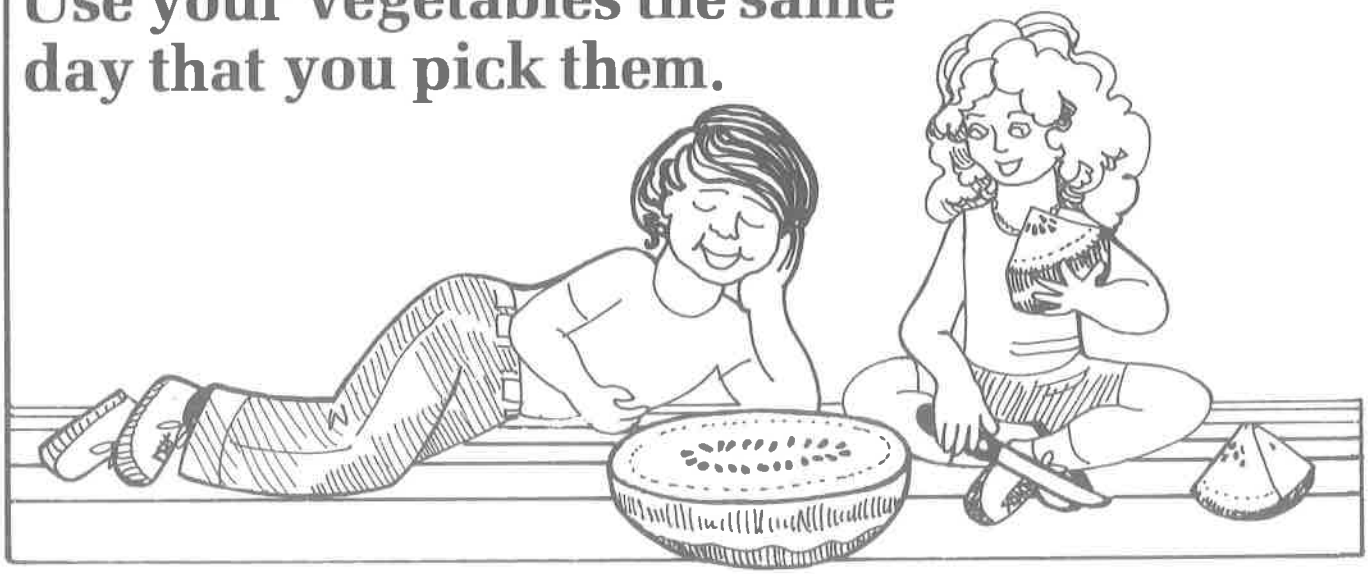
10

Vegetables taste best when they are young and tender.



Your vegetables are ready to pick when they look like the picture on the seed packet.

Use your vegetables the same day that you pick them.



F E R T I L I Z E R T E S T

P L O T P R O J E C T

A University of California
Agricultural Extension
Service Result Demonstration

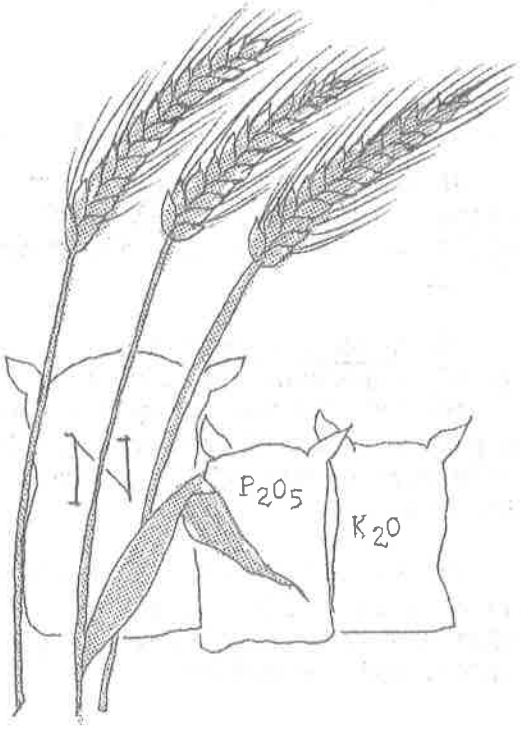
Co-operative Extension work in Agriculture and Home Economics,
College of Agriculture, University of California, and
United States Department of Agriculture co-operating.
Distributed in furtherance of the Acts of Congress of
May 8, and June 30, 1914. George B. Alcorn, Director,
California Agricultural Extension Service.

4-H-Ag-152

FERTILIZER PLOT MANUAL

UNIVERSITY OF CALIFORNIA . . . AGRICULTURAL EXTENSION SERVICE

INTRODUCTION



You can have a lot of fun in your fertilizer project. Before you start your fertilizer project talk it over with your parents. If they raise crops they can tell you whether or not its a good idea to have a fertilizer project on your place. You also may wish to talk it over with your 4-H Leader or County Farm Advisor.

Having a fertilizer plot project does not require much of an investment.

For a Fertilizer Plot you will need:

1. Stakes
2. String
3. Bucket
4. Scales (for weighing fertilizer)
5. Measuring tape
6. Fertilizer (In most cases this will be supplied by the Farm Advisor's Office).

A 4-H member who is truly interested in growing better crops and improving production will receive a great deal of knowledge and enjoyment from this project. The same principles learned on a small plot can be applied on a large farming operation.

FERTILIZER ELEMENTS

1. The elements which a plant needs for normal growth may be divided into the following groups:

Chemical Symbol	Name		
C	Carbon	_____	Plant gets from air and water
H	Hydrogen		
O	Oxygen		
N	Nitrogen	_____	Major plant food elements. Plant gets from soil.
P	Phosphorus		
S	Sulfur		
K	Potassium		
Ca	Calcium	_____	Secondary plant food elements. Plant gets from soil.
Mg	Magnesium		
Bo	Boron	_____	Trace plant food elements. Plant gets from soil.
Mn	Manganese		
Cu	Copper		
Zn	Zinc		
Fe	Iron		
Mo	Molybdenum		

The major elements are those which are used in the greatest quantity by plants and are therefore the most important. Because they are used by plants in great amounts, soils are often low in these elements. That is the reason the common fertilizers contain one or more of these elements. The major elements are listed in what is presently considered their order of importance for California conditions, but not necessarily so for conditions found in other parts of the United States.

Of the secondary elements calcium is used in fertilizers mainly to correct soil acidity or black alkali.

The trace elements are equally important for normal plant growth, but are needed by the plant only in very small amounts. Most soils have enough of these trace elements.

In your 4-H Fertilizer Project you will be working mainly with the major elements (Nitrogen, Phosphorus, Sulfur, and Potassium).

The lack of any plant nutrient will cause the plant to suffer. When a plant shows symptoms of suffering from a deficiency of a nutrient it is the farmer's job to try to determine which element or elements the plant needs to resume normal growth. Although many symptoms of plant nutrient deficiency are distinct, some are so similar to others as to be difficult to recognize. This fact makes it doubly hard to determine exactly what the plant needs. A fertilizer plot is an excellent method of finding out which nutrients are deficient in the soil.

The exact functions of many of the plant food elements are not definitely known. On the other hand more is known about what happens to a plant if a certain element is withheld.

NOT ENOUGH NITROGEN CAUSES

1. Slow growth
2. Yellow color
3. Poor production
4. Low protein in plant

NOT ENOUGH PHOSPHORUS CAUSES

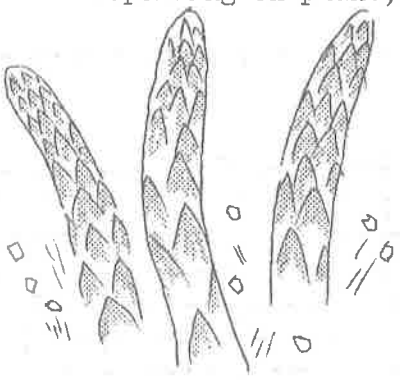
1. Delayed maturity
2. Poor growth
3. Coloration of leaves (dark green, purple or brown, depending on plant)

NOT ENOUGH SULFUR CAUSES

1. Slow growth
2. Pale green color of Legume Leaves

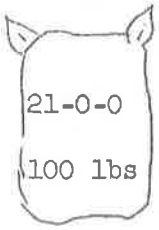
NOT ENOUGH POTASSIUM CAUSES

1. Poor growth
2. Leaf scorch
3. Legumes show white or yellow dots around tips of leaves. These dots later turn brown, leaving a scorched leaf.

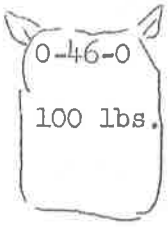


HOW TO READ THE LABEL ON A BAG OF FERTILIZER

On each bag of fertilizer will be a printed label showing how much of each element is found in the bag of fertilizer.



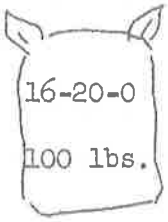
A bag of fertilizer with a label like this (21-0-0) means it contains 21 pounds of nitrogen and no phosphorus or potassium for each 100 pounds.



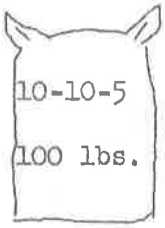
A label like this (0-46-0) means for each 100 pound sack of fertilizer there is no nitrogen, 46 pounds of phosphorus (P_2O_5), and no potassium

This label means there is no nitrogen, no phosphorus, and 62 pounds of potassium (K_2O) in a 100 pound sack.

Some fertilizers which we call combination fertilizers contain more than one element.



A combination fertilizer with a label as shown means that in each 100 lb. sack there are 16 pounds of nitrogen, 20 pounds of phosphorus (P_2O_5) and no potassium.



A combination fertilizer containing three of the major elements is often called a "complete" fertilizer. In each 100 lb. bag of fertilizer as shown there are 10 lbs. of nitrogen, 10 lbs. of phosphorus (P_2O_5) and 5 lbs. of potassium (K_2O).

In addition to dry fertilizer there are also liquid fertilizers. For plot work you will use only a dry fertilizer, since it does not require the use of special equipment.

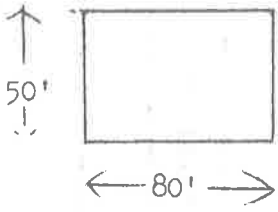
Examples of some of the more common fertilizers you will use in your plot are as follows:

Fertilizer	% of Element			
	Nitrogen	Phosphorus (P_2O_5)	Potassium (K_2O)	Sulfur
1. Ammonium Nitrate	33%	0	0	0
2. Ammonium Sulfate	21%	0	0	23
3. Urea	45-46	0	0	0
4. Single Superphosphate	0	19%	0	9
5. Treble Superphosphate	0	44-48	0	0
6. Potassium Chloride	0	0	60	0
7. Potassium Sulfate	0	0	50-51%	17%
8. Gypsum 98%	0	0	0	18%

HOW TO FIGURE AREA

To calculate the number of square feet in your plot multiply the length times the width.

For example: If your plot is 50 feet wide and 80 feet long



Length x width = area

80 ft. x 50 ft. = 4000 square feet

Using the above example lets find out what fraction of an acre it is. There are 43,560 square feet in an acre.

$$\frac{4000}{43{,}560} = 0.0918 \text{ acre}$$

HOW TO FIGURE AMOUNTS OF FERTILIZER

If you had applied 10 pounds of ammonium nitrate to the above plot how much fertilizer would that be per acre?

$$\frac{10 \text{ lbs.}}{0.0918 \text{ acre}} = 109 \text{ pounds per acre}$$

We know that Ammonium Nitrate contains 33% nitrogen or 33 pounds of nitrogen for each 100 pounds of fertilizer.

$$\frac{109 \text{ pounds} \times 33\%}{100} = 36 \text{ pounds of actual nitrogen per acre}$$

Different crops require different amounts and kinds of fertilizer. One of the purposes of your fertilizer project will be to find out what kind of fertilizer is best suited for your crop. In your 2nd and 3rd year you will find out how much fertilizer give the best and most economical growth.

The time to apply a fertilizer is also important. Sometimes the fertilizer is applied before the crop is planted, but frequently there is an advantage to applying only part of the fertilizer at first. The rest of the fertilizer is applied later during the growing season. This method is called a split application.

HOW MUCH DO FERTILIZERS COST?

If superphosphate cost $40.00 per ton and you wish to apply 300 pounds per acre, how much will it cost per acre?

1 ton = 2000 lbs. or 20 cwt.

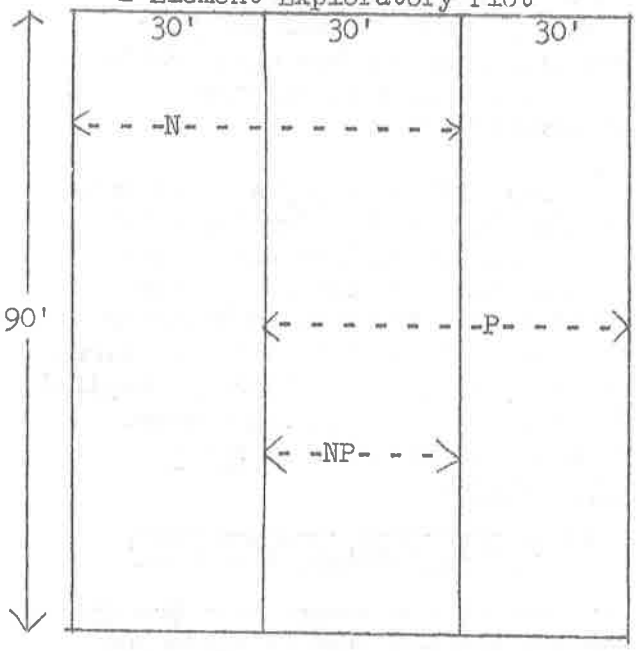
$\frac{\$40.00}{20 \text{ cwt.}}$ = $2.00 per 100 lb. sack (or 1 cwt)

3 cwt. x $2.00 = $6.00 per acre

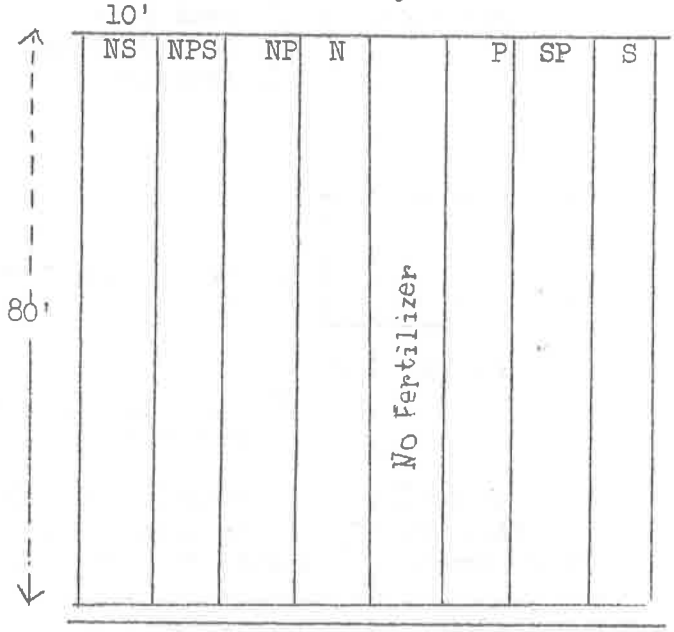
HOW TO LAY OUT YOUR PLOT TO FIND OUT WHAT ELEMENTS ARE DEFICIENT

Examples of plot layouts:

#1
2 Element Exploratory Plot

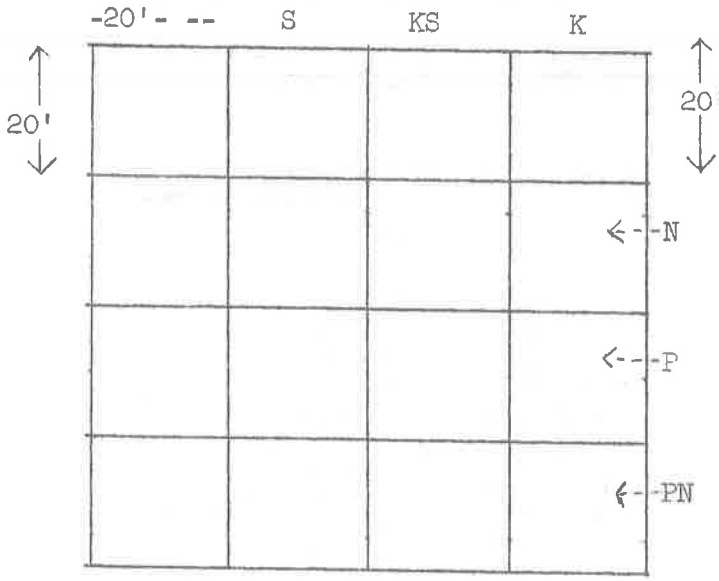


#2
3 Element Exploratory Plot

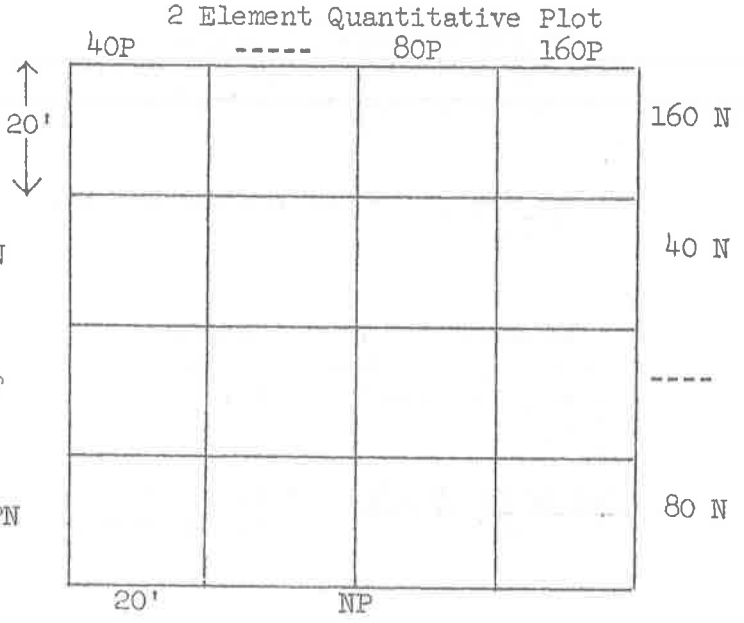


HOW TO LAY OUT YOUR PLOT TO FIND OUT HOW MUCH FERTILIZER IS NEEDED.

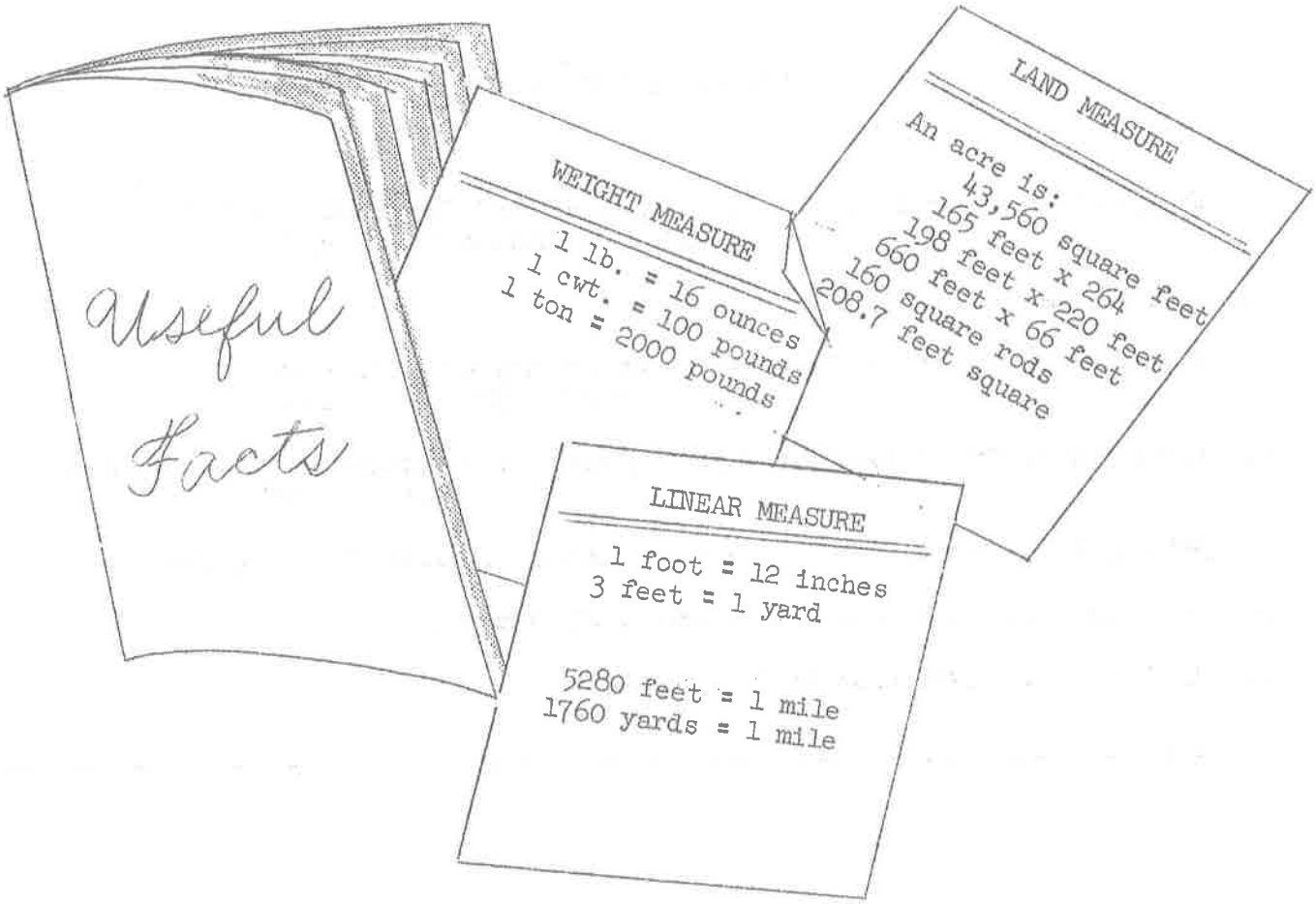
#3
4 Element Exploratory Plot



2 Element Quantitative Plot



There are many other possibilities for plot layouts. Consult your farm advisor for help in selecting a satisfactory plot layout for your problem.



TO FIGURE RATE OF APPLICATION

Pounds per acre	Equivalent quantity per 100 sq. feet
100	3½ oz.
200	7½ oz.
300	11 oz.
400	14 3/4 oz.
500	1 lb. 2½ oz.
600	1 lb. 6 oz.
700	1 lb. 10 oz.
800	1 lb. 13 oz.
900	2 lb. 1 oz.
1000	2 lb. 5 oz.
2000	4 lb. 10 oz.

SOURCES OF INFORMATION

1. Western Fertilizer Handbook - Published by Soil Improvement Committee, California Fertilizer Association

2. U.S.D.A. Leaflet No. 307, April 1951

3. Gypsum and Other Sulfur Materials - University of California Circular 503, March 1951

4. Fertilizers, Soil Analysis and Plant Nutrition - University of California Circular 367

5. Principles of Field Crop Production - Martin and Leonard, MacMillan Co.

6. Irrigated Soils - Thorne and Peterson, Blakiston Company

7. W. E. Martin - Extension Soils Specialist

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. George B. Alcorn, Director, California Agricultural Extension Service.

7/61--1,000

4-H Cooperative Test Plot Project Outline Fertilizer Plot

God borders the brooks with violets -
Don't forget to put the finishing touches on your work.

Objectives

1. To develop an understanding of experimental methods.
2. To learn the values and results from proper fertilizer application.
3. To learn how to set up and conduct a sound experimental plot.
4. To learn to observe, measure and evaluate test plot results.

General Rules

1. The fertilizer plot project may be carried on the home garden, on irrigated pasture, on native range or non-irrigated pasture or on a commercial crop.
2. It must be approved by your local 4-H club leader and the Farm Advisor.
3. The project should fit into your general project program, i.e. with a meat animal, dairy, or crop project.
4. Take pictures at various intervals showing fertilizer responses.
5. Follow the procedures outlined in the fertilizer plot project manual.

F I R S T Y E A R L E V E L

1. Conduct an exploratory fertilizer test plot to find out which elements give a response.
2. Learn to read and understand a fertilizer label.
3. Learn the common fertilizers used in your area.
4. Learn to figure acreage, plot area, and amounts of fertilizer applied.

SECOND YEAR LEVEL

1. Conduct a fertilizer test plot using the elements giving the best responses in your first year exploratory plot to find out the best amounts to use.

2. Make and compare a split level application with a single application.

3. Keep an accurate record of your observations.

4. Report your results to your farm advisor.

5. Give a demonstration or talk on your fertilizer test plot.

THIRD YEAR AND ADVANCED

1. Conduct a fertilizer test plot evaluating results of grazing records, actual weight records, etc.

2. This project must be approved and carried under the direction of the farm advisor.

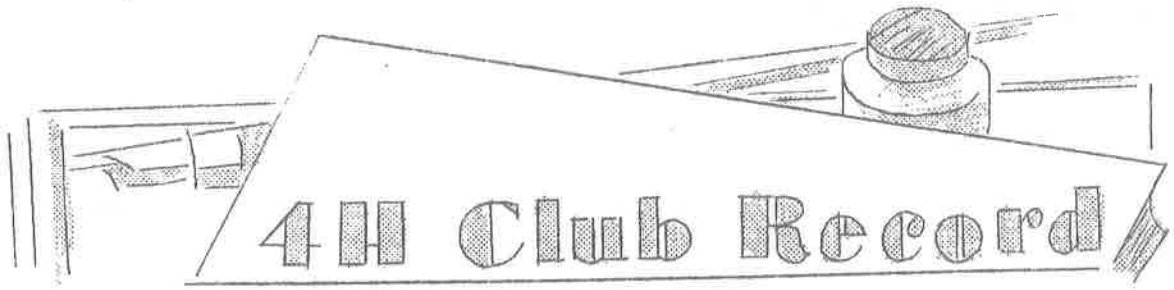
3. Write a complete report on your project including need, methods used, layout, results, conclusions and further tests that need to be made.

4. Give a public presentation of your test plot results.

LEARN BY DOING!

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture, co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. George B. Alcorn, Director, California Agricultural Extension Service.

8/59--1,000



4H Club Record

Fertilizer Plot

YEAR _____

NAME _____ AGE _____ YEAR IN THIS PROJECT _____

YEAR IN CLUBWORK _____ NAME OF 4-H CLUB _____

HOW TO KEEP YOUR RECORD

Keep this record in your record book cover.
If you need more space add extra pages.
List everything you do in this project as you do it.
Add clippings, pictures, diagrams and any other items which will make your record more complete.

PLANNING

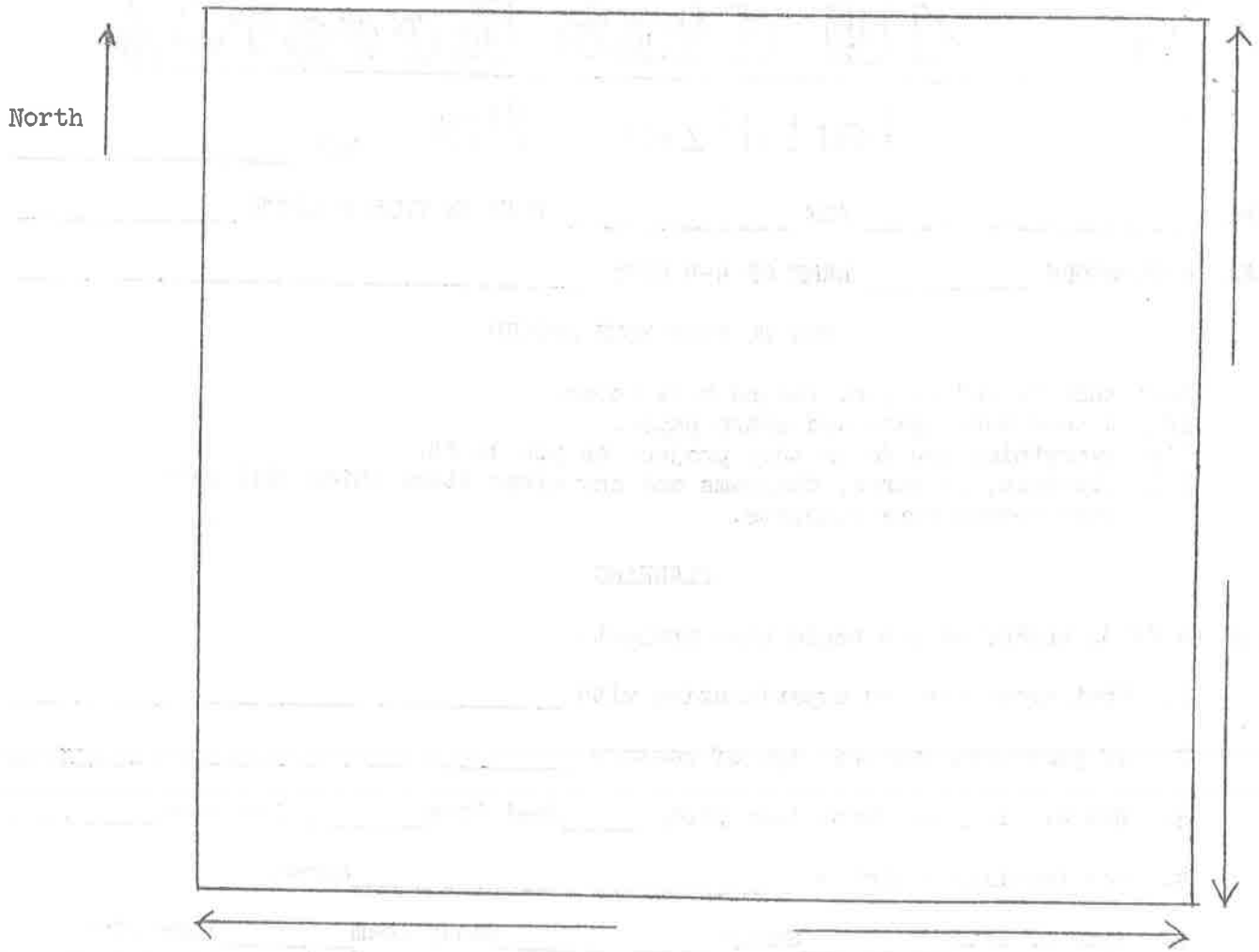
FILL IN THESE BLANKS as you begin this project:

1. What crops are you experimenting with _____
2. If permanent pasture, age of pasture _____
3. How big is your fertilizer plot_____feet long_____feet wide_____
4. May fertilizer plot = _____Acres.
5. Type of soil_____Sandy_____Sandy loam_____Loam clay
6. Type of irrigation_____flooding_____sprinkler____furrow_____none
7. Is the ground_____level or_____sloping
8. Fertilizer history of plot_____

   _____
9. Crop history of plot _____
10. When was fertilizer applied _____.

    _____
11. Date project completed _____

Diagram of your fertilizer plot.



Record of Fertilizer Applied:

Symbol	Nutrient	Source	Am't per Strip	Am't per Acre	Am't of actual Nutrient per Acre
N	Nitrogen				
P	Phosphorus (P_2O_5)				
S	Sulfur				
K	Potassium (K_2O)				

O B S E R V A T I O N C H A R T

Date of Observation	Rate Fertilizer Square Showing Best Results 1st, 2nd, 3rd, etc.														
	N	NP	P	S	NS	NPS	PS	K	NK	NPK	PK	SK	NSK	NPSK	PSK

PICTURES OF MY FERTILIZER PLOT

SUMMARY

Which fertilizer gave the best results:

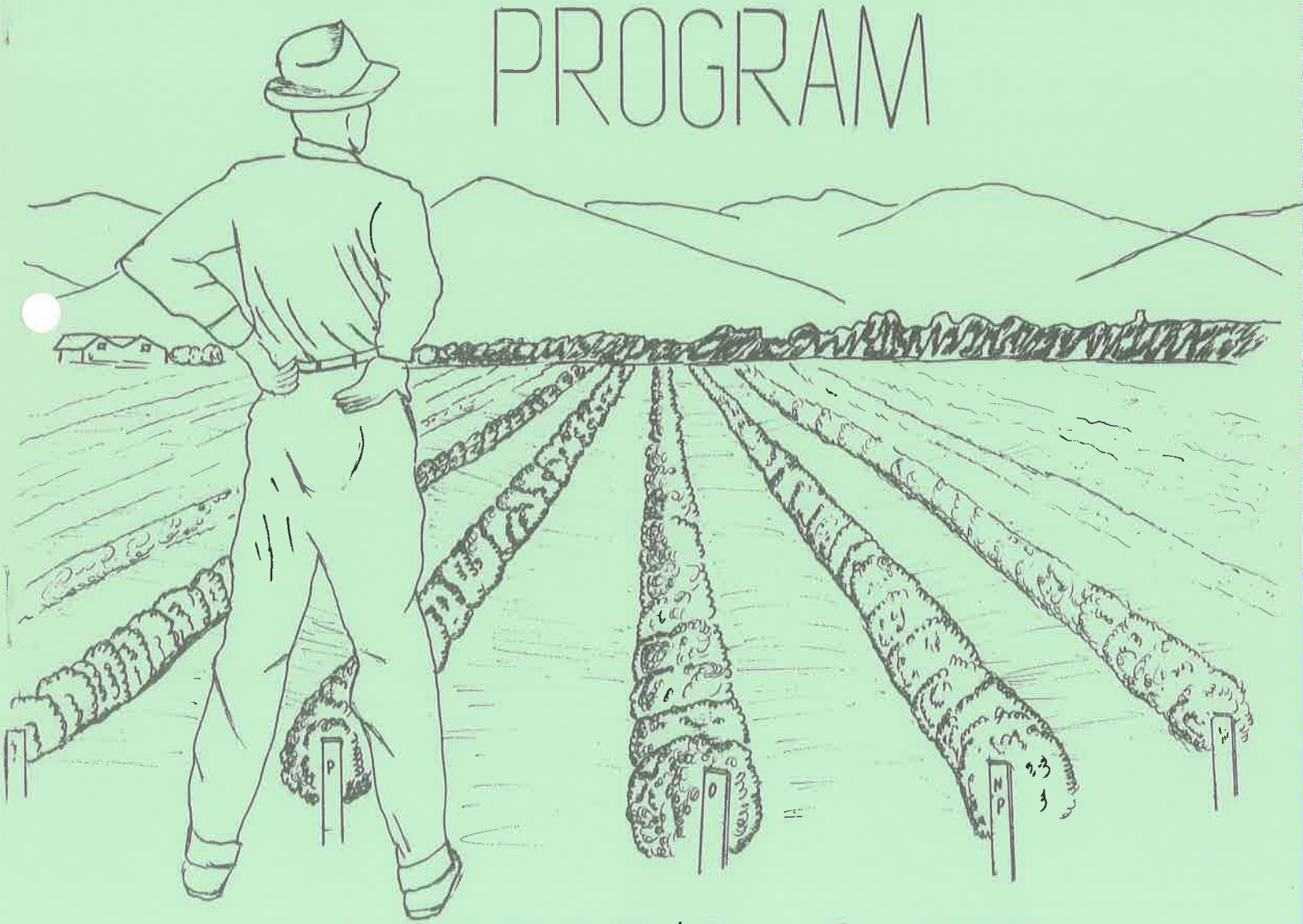
	Fertilizer	Rate of application
1st.		
2nd.		
3rd.		
4th.		

CONCLUSION

Tell what you have learned from this year's project and what you want to do in the fertilizer project next year.

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating.
Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914.
George B. Alcorn, Director, California Agricultural Extension Service.
12/63-800

FIELD TRIP UNIT OF PLANT SCIENCE PROGRAM



LEADER'S GUIDE

4-H—Ag151

WELCOME to a NEW 4-H TEACHING PROGRAM

- improves education of members
- saves your preparation time
- is fun to use

The first page of this leader's guide is an outline of the field trips to be taken during the year. The worksheets and suggested procedures are to help you conduct field trips so that members will learn the subject matter involved.

You will hold at least five field trip meetings during the year to complete this field trip unit. Trips should be taken in the order which will be more helpful to your own project members. It will be helpful to you and your members to review the questions on the worksheets before and after taking each field trip.

The leader may wish to conduct one or more tours in combination with another plant science teaching unit. This may be done but will not constitute a completed tour unit. The worksheets and procedure will serve as a valuable guide in handling this situation.

An oral report on each field trip to the community 4-H club meeting will increase the interest of all 4-H members in this unit. If you need help with ideas, contact your farm advisor. Enjoy your 4-H leadership.

Prepared by: Bob Sheesley, Farm Advisor
Fresno County

Assisted by: Harry L. Miller, 4-H Specialist
Davis

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. George B. Alcorn, Director, California Agricultural Extension Service.

MARCH 1965—1500

PLANT SCIENCE

F I E L D T R I P U N I T

(Do any five or more of the following)

(Intermediate Unit)

DO	AIDS TO USE	SUGGESTED PROCEDURES
Visit a Nursery	Member's Worksheet #1	- Call nursery manager to make an appointment. - Outline Tour plans with manager. - Instruct members to observe, ask questions and make notes. - Brief members on type of visit, role of facility and precautions. - On the tour introduce the manager and the guide. - Have members fill out check sheet. - At the end of the tour thank the manager and the guide. - Instruct members to keep completed check sheets for record book and give an oral report at the next community meeting. (The report should cover 2 or 3 of the most interesting things they have learned). - Select a member to write a thank you letter to the manager. - General discussion of the tour with members involved.
Visit a Processing or Packing Plant of a Crop	Member's Worksheet #2	Follow suggestions for procedure outlined for visit to a nursery.
Tour a Soils or Plant Tissue Analysis Laboratory	Member's Worksheet #3	Follow suggestions for procedure outlined for visit to a nursery.
Tour a Wholesale or Retail Market	Member's Worksheet #4	Follow suggestions for procedure outlined for visit to a nursery.
Visit a Crop Harvesting Operation in Progress	Member's Worksheet #5	Follow suggestions for procedure outlined for visit to a nursery.
Attend a 4-H Club Project Tour	No Aids Provided	Tour may be conducted by: 1. Visiting each member's home. 2. Have several members gather

DO	AIDS TO USE	SUGGESTED PROCEDURE
		their projects at 3 or 4 central locations and visit those spots. 3. Visit selected projects representative of the membership. 4. Each member visited will discuss the following items as his project is visited - - Kind of crop or other project - Purpose of crop or other project - When and how project was started - Time and plans for harvest and marketing of product - Estimated expenses and income - What cultural practices are being used (tillage, irrigation, pruning, fertilization, pest control, etc.) - Amount and kinds of fertilization used - Estimated production of project - What skills and knowledge have been developed with the project
Attend a Crop Field Day for Adults	No Aids Provided	Attend meetings of adult groups such as: - Agricultural Extension Field Day - Irrigation District - Crops, Soils, or Entomology - Brush Control - Conservation District
Visit a Successful Farm	Member's Worksheet #6	You might visit more than 1 type of ranch. The leader should meet with the person conducting the visit to outline the tour and discuss what members would like to see. - The business side of the operation should be stressed along with important aspects of production. - Members should have questions in mind to ask on the visit - financial, management or cultural practices.

WORKSHEET #1

VISIT TO A NURSERY

Name_____ Type of Business Visited _____

Date of Trip_____ Name of Business_____

Member's Check Sheet
(Fill in during and after the trip)

1. What products do you handle?_____

_____

2. Source of products sold?_____

3. What cultural practices are necessary? (Example: irrigation, pest control, weed control, cultivation, etc.)_____

_____

_____

4. What inspection requirements are there for your products?_____

_____

Who performs the inspections?_____

5. What method of selling is used?_____Cash _____Contract _____Credit

6. Who owns the facilities and the business?_____

7. What records do you find necessary in this business?_____

_____

8. What are the career possibilities in the nursery business?_____

_____

9. How can a person prepare himself for employment in this field?_____

_____

Questions for leader and members to ask.

10._____

11._____

12._____

13._____

14._____

(I N T E R M E D I A T E U N I T)

WORKSHEET #2

VISIT TO A CROPS PROCESSING OR PACKING PLANT

Name_____ Type of Business Visited_____

Date of Trip_____ Name of Business_____

Location_____ Size of Operation_____

Member's Check Sheet
(Fill in during and after the trip)

1. What products are handled?_____
2. Who produces the product?_____
3. Length of shipping season_____ Daily Volume_____
4. Dates of shipping season_____
5. What operations are performed at the plant?_____

_____

6. Who owns and operates the business?_____
7. How many people are employed at the plant?_____
8. What inspection requirements in this plant or the product packed subject to and who performs the inspection?_____

_____

_____

9. What grade standards are used for the product shipped?_____

_____

10. How are your products marketed? _____ Wholesale _____ Retail
11. After the products leave the plant they are:

_____ Delivered to stores by the plant.
_____ Picked up at the plant by stores.
_____ Sold directly to the consumer from the plant.
_____ Sold directly to the consumer on routes from the plant.
_____ Sold F.O.B.
_____ Sold through Commission
_____ Sold by Broker
_____ Sold at auction

12. How are the products shipped to market? _____Rail _____ Truck _____Air
13. What records do you find necessary in this business?_____

_____

_____

14. How can a person prepare himself for employment in this field?_____

_____

Questions for leader and members to ask.

15._____

16._____

17._____

WORKSHEET #3

TOUR OF A SOILS OR PLANT TISSUE ANALYSIS LABORATORY

Name_____ Type of Business Visited_____

Date of Trip_____ Name of Business_____

Member's Check Sheet
(Fill in during and after the trip)

1. What services does your laboratory perform?_____

_____

2. Who uses these services? (Who are the customers?)_____

_____

3. Who owns and operates this business?_____

4. What are the most common chemical analyses performed by this laboratory?_____

_____

_____

5. What are the main items of equipment found in this laboratory and their use?

Name of Item Use

_____

_____

_____

_____

6. How do the services of this laboratory aid agriculture in the area?_____

_____

_____

7. What are the career possibilities in this business? How can a person prepare himself for employment in this field?_____

_____

8. Educational requirements for employment._____

Questions for leader and members to ask.

9. _____

10. _____

11. _____

12. _____

13. _____

(I N T E R M E D I A T E U N I T)

WORKSHEET #4

TOUR A WHOLESALE OR RETAIL MARKET

Name_____ Type of Business Visited_____

Date of Trip_____ Name of Business_____

Location_____ Size of Operation:

Large_____ Medium_____ Small_____

Member's Check Sheet
(Fill in during and after the trip)

1. How many different products are handled?_____
2. Is your business wholesale, retail or both?_____
3. Area served by wholesale market_____Population served_____
4. What method of selling is used? _____Cash _____Contract _____Credit
5. What methods are used to improve customer acceptance of products?_____

_____

6. How long are products held?_____Rate of turnover_____
7. How are agricultural products displayed? Where in the store are these located? ____

_____

8. Agricultural products represent what % of total sales?_____
9. From where do the agricultural products come?_____

_____

10. Who owns the facilities and the business?_____
11. What inspection requirements are there for your products?_____

_____

Who performs the inspection and when?_____

12. How many people are employed?_____
13. What are the career possibilities and what preparations are necessary for employment?_____
14. How many different operations are performed on your agricultural products between the producer and the consumer?_____

_____

_____

15. Major problems confronting business_____

_____

Questions for leader and members to ask.

16._____

17._____

(I N T E R M E D I A T E U N I T)

WORKSHEET #5

VISIT A CROP HARVESTING OPERATION IN PROGRESS

Name_____ Type of Business Visited_____

Date of Trip_____ Name of Business_____

Member's Check Sheet
(Fill in during and after the trip)

1. What crop is being harvested?_____
2. Who owns and operates this farming enterprise?_____
3. Land preparation required for harvesting?_____
4. What equipment is being used in this operation?_____

_____

_____

_____

5. What jobs are performed by people in this operation?_____

_____

6. How many people are employed?_____
7. How is the crop removed from the field and in what type of containers?_____

_____

8. How is quality maintained in harvesting?_____

_____

9. Where are the crops sent after leaving the field?_____

_____

10. How long does it take to harvest one acre of this crop?_____
11. What problems need solving to improve harvest?_____

_____

12. If mechanical harvesting is not now in use what are its possibilities in handling the crop?_____

Questions for leader and members to ask.

13._____
14._____
15._____

(I N T E R M E D I A T E U N I T)

WORKSHEET #6

VISIT A SUCCESSFUL FARM

Name_____ Type of Farm Visited_____

Date of Trip_____ Name of Farmer_____

Size of Farm Unit: Crop Acres_____ Non Crop Acres_____

Member's Check Sheet
(Fill in during and after the trip)

What part of farm is owned_____ leased_____

1. Major machines in use on the farm. (Example: Cotton Picker)

   1._____ 3._____ 5._____ 7._____

   2._____ 4._____ 6._____ 8._____

2. Products sold on the farm? What?

   1._____ 2._____ 3._____ 4._____

3. Where sold:

   1._____ 2._____ 3._____ 4._____

   How sold:

   1._____ 2._____ 3._____ 4._____

4. What crops are found on the farm?_____ _____ _____

   _____ _____ _____ _____

5. What animals are a part of the farming operations?_____

   Kind: 1._____ 2._____ 3._____

   Number: 1._____ 2._____ 3._____

6. To what factors does the farmer contribute his success?_____

   _____

7. How did the farmer get started?_____

   _____

8. Did the farmer go to college? ☐ Yes ☐ No. If yes, what course did he take?_____

9. Did the farmer mention any advantages of farming?_____

   _____

   Disadvantages:_____

   _____

(I N T E R M E D I A T E U N I T)