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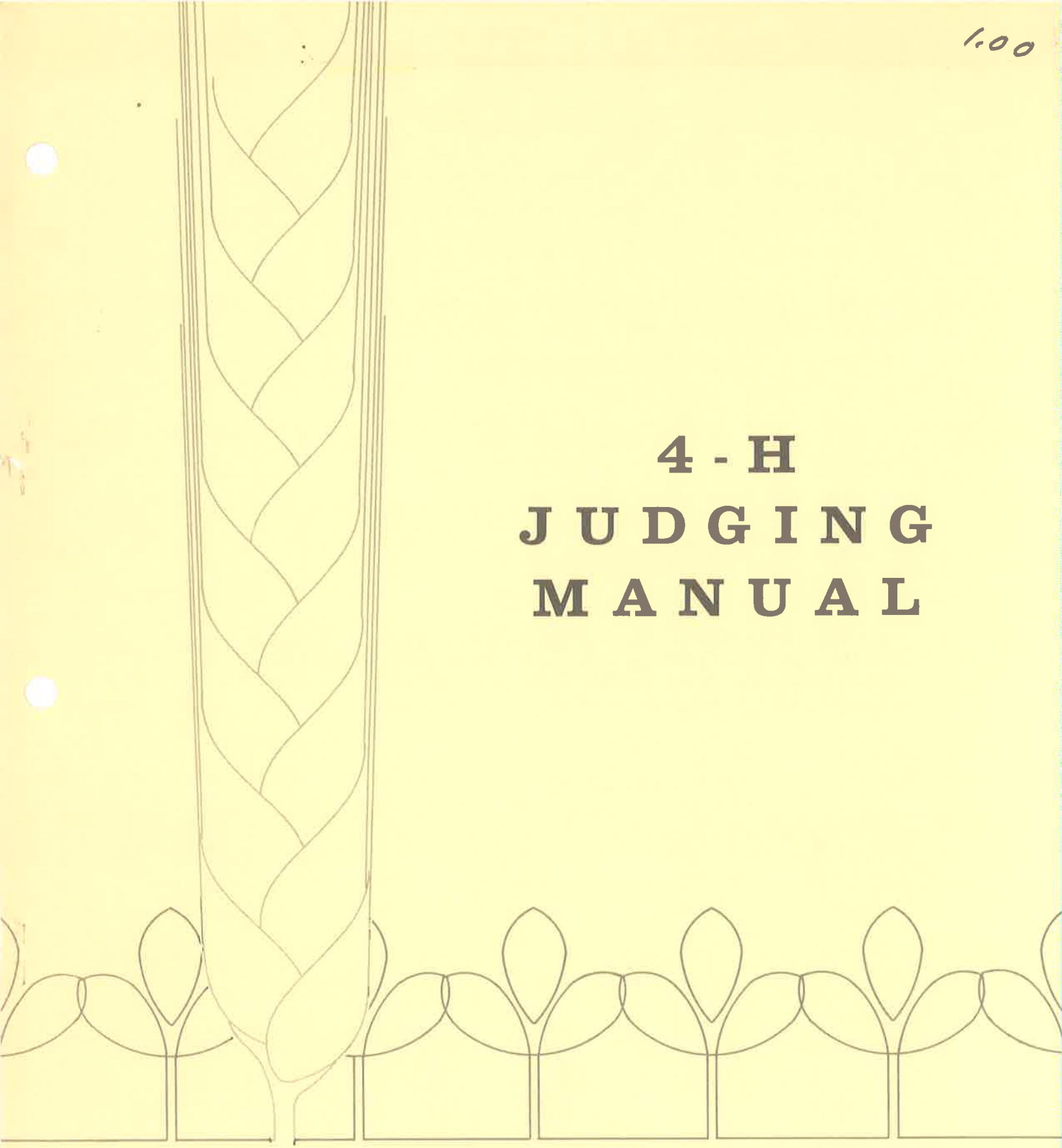

4-H JUDGING MANUAL

cereal and forage crops

UNIVERSITY OF CALIFORNIA AGRICULTURAL EXTENSION SERVICE

4-H—Ag10

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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

CEREAL AND FORAGE CROP 4-H JUDGING MANUAL

This manual is in two sections—the first for beginning members and the second for more advanced members. The first section is designed to teach certain basic principles used in judging cereal and forage crops to beginning members in field crops judging. It also offers suggestions to prospective judges on "setting up" beginning classes for new members learning to judge these crops.

BEGINNING MEMBER

To become proficient in crop judging, it is necessary to spend many hours perfecting this skill. This manual introduces the member to the basic crop judging principles which he must learn before he can develop fully his judging talents.

CEREAL CROPS

Cereal judging procedures are based upon the desirable qualities to be found in a seed crop. After learning to judge cereals for seed, a member may then advance to the more complicated task of judging them for feed purposes.

The score card below lists the factors and their relative importance that a contestant should use in judging a cereal class as a seed crop. This score card may be used in judging classes of barley, oats, rye, and wheat.

SCORE CARD FOR CEREALS		A	B	C	D
Freedom from: noxious weeds	35				
mixture	25				
thin, discolored, cracked kernels, and heat damage	15				
insect damage	15				
inert material	10				
TOTAL	100				

Team No._____ Club _____

Name _____

Placing | | | | |

CHARACTERISTICS TO LOOK FOR IN JUDGING CEREAL SEEDS

1. Freedom from noxious weeds

The weeds generally included as "noxious" are Johnsongrass, dodder, star thistle, horsenettle, morning glory, Russian knapweed, quackgrass, and ripgut. Identification of these weed seeds is explained under "Suggestions for Setting Up a Seed Class." None of the "common" weed seeds, such as mustard or bermudagrass, are included in this class. Only those that are considered under California law and conditions to be particularly serious have been listed.

2. Freedom from mixture

This includes mixtures of other crop seeds with the seeds that constitute the sample. If the contestant is judging a class of seed oats, for instance, barley and/or vetch in the sample would constitute "other crop" seed, and the sample would be "mixed." It can also mean other varieties of oats, as indicated by distinct differences in shape and color. Generally, mixtures of two varieties of the same species are not recommended for beginning class contests.

3. Freedom from thin, discolored, moldy, and cracked kernels

This includes broken and cracked seeds, shrunken kernels, and weathered, musty, and diseased seed. These characteristics generally are easy to identify visually. Grain which heats in storage becomes darkened in appearance and, usually, the germination is damaged. Moldy grain is easily detected by smell.

4. Freedom from insect damage

Seed should be free from insects, since their presence can result quickly in seed germination damage and legal condemnation, if the seed is moved for food purposes.

5. Freedom from inert material

Seed should be free from stems, dirt, and chaff. These generally make the sample appear deficient, but a "trashy" sample might otherwise be good seed. Trash in the seed does interfere with the proper working of the seed drill at planting time.

SUGGESTIONS FOR JUDGING A CEREAL CLASS

1. Seeds generally will be exhibited in an open-faced receptacle, such as a tin pie plate or grain sample pan, preferably blue or white in color. Before examining the samples closely, observe them generally for differences in color and shape. Quite frequently these differences are more easily noted from a distance of several feet from the samples. Usually the top and bottom samples can be placed quickly. Heat-damaged and musty samples can be spotted by sight and by smell.

2. Use a sharp, pointed object, such as a pencil, to move the seed samples around for closer examination. **Never pick the sample up in your hand and run it through your fingers.** This is considered poor technique and frequently causes mixture of samples.

3. Look closely for small weed seeds. Compare any irregularly shaped seeds with the seed samples that are generally displayed. Look carefully for live or dead insects and for holes in the seeds.

4. **Follow the point values on your score card for the factors you are evaluating.** This is the only way you can develop skill in judging a seed crop.

SUGGESTIONS FOR SETTING UP A SEED CLASS

When selecting and setting up the class, remember that the contestants judging this class are beginners. Consequently, they are not skilled in methods used in evaluating and judging cereal crops.

Teach the beginning member first to recognize the basic factors in cereal crop judging. Do not expect him to detect small percentages of a mixture of another cereal. Do not put three or four weed seeds in a sample and expect him to detect them. Make sure that the characteristic you are trying to acquaint the member with is discernible easily, if he uses the proper judging techniques. The classes should be easy at first to develop confidence in the member.

The best way to prepare a class of cereals for judging is to run the desired lots carefully through graduated screens to produce the required four samples with accentuated characteristics. The top sample would have all thins and weed seed removed, as well as broken and cracked kernels. Some of the brokens and thins could be added to make a second sample. Heat- or insect-damaged screenings would be added to another sample. Weed seed screenings could be used in a fourth. Classes ranging from very simple to very complex ones can be prepared by the skillful use of screened samples and screenings.

To help the member recognize noxious weed seeds, it is advisable to have properly labeled samples for him to refer to. The beginning member, however, should not be required to identify differences in weed seeds which closely resemble each other. Closely related seed may be substituted for the real weed seed. For example, sudangrass seed may be used in samples to represent Johnsongrass seed.

Reminder: The beginning member, in scoring the cereal class, will give or take away the total point value for each characteristic being judged, depending on its presence or absence. For example, if noxious weeds are present, the sample would be scored down on this point. Members are trying to recognize basic judging characteristics, not make fine point evaluations at this time.

A typical class of barley could be arranged in the following manner:

Contains:	A	C
	Cracked kernels, heat damage Insect damage	Noxious weeds Insect damage
	B	D
	Crop mixture	Inert material

A correct score card for this class would look like this:

Class Seed Barley

SCORE CARD FOR CEREALS

		A	B	C	D
Freedom from: noxious weeds	35	35	35	0	35
crop mixture	25	25	0	25	25
thin, discolored, cracked kernels, and heat damage	15	0	15	15	15
insect damage	15	0	15	0	15
inert material	10	10	10	10	0
TOTAL	100	70	75	50	90

Team No. IV Club Ranchers 4-H

Name John Smith

Placing | D | B | A | C |

ADVANCED MEMBER

When the 4-H member is well acquainted with the basic concepts of judging a class of seed cereals, a more advanced judging class is desirable to develop further his judging skills and maintain his interest in cereal crops.

The score card for the more advanced member is given below:

Class_____

SCORE CARD FOR CEREALS			A	B	C	D
Freedom from weed seeds		35				
Noxious weeds	(25)					
Common weeds	(10)					
Freedom from mixture		25				
5% or greater	(10)					
Another variety	(10)					
Other crops in small amounts	(5)					
Soundness		30				
Freedom from:						
Weathered, musty, heat-damaged, and diseased kernels	(10)					
Cracked or broken kernels	(10)					
Insect damage	(10)					
Freedom from inert material, dirt, stems, and chaff	(10)	10				
TOTAL		100				

Team No._____ Club _____

Name _____

Placing | | | | |

CHARACTERISTICS TO LOOK FOR IN JUDGING AN ADVANCED CEREAL SEED CLASS

1. Freedom from weed seeds

In this class advanced students should be able to distinguish the seeds of noxious weeds, less serious common weeds, and common crop seeds, such as:

Johnsongrass	vs. sudangrass
Quackgrass	vs. intermediate wheatgrass
Dodder	vs. alfalfa
Morning glory	vs. vetch or peas

They also should be familiar with some of the more common weed seeds, such as mustard, wild radish, pigweed, lambsquarter, and wild oats.

In judging this class, a sample containing noxious weeds would receive a minus 25, a sample containing **only** mustard (common weed seed) a minus 10.

2. Freedom from mixture

The advanced member should be able to identify and distinguish differences among barley, oats, rye, and wheat. He also should be able to identify differences among varieties, provided there are fairly distinct differences in shape and color.

Mixture in this advanced class includes mixtures of other cereals, other varieties, and other crop seeds. The subsections in this class have been weighted individually, and their total will not necessarily add up to the total score of the major subdivision. For example, if a sample in a class of California Mariout Barley contains a 10% mixture of Kanota oats, it will receive a minus 25. In addition, if it contains Blanco barley (another variety), this would be noted but not scored since this score would exceed the total score for the major subdivision. However, in a close class, this additional factor could be evaluated in the final judgment. Also, if the sample contained **only** sudangrass (other crop seed), it would receive a minus 10.

3. Soundness

Here the member should be able to recognize weathered, heat-damaged, musty, insect-damaged, diseased kernels, and to detect thresher-damaged seeds. Again, a reminder that these factors have been individually weighted, and the total point value for this major subdivision cannot exceed a minus 30.

4. Freedom from Inert Material

Same as beginning class.

A typical class for advanced students judging a class of California Mariout Barley could be:

A
Mustard seeds (common weed)
Sudangrass (other crop seeds)

B
Blanco Barley (another variety)
Musty, heat-damaged kernels
Straw (inert material)

C
Morning glory seeds (noxious weed)
10% Kanota oats (mixture)
Sudangrass* (other crop seed)

D
Alfalfa seed (other crop seeds)
Insect damage

*Noted, but not scored down because problem not serious.

The correct score card for this class would be:

Class California Mariout Barley

SCORE CARD FOR CEREALS

			A	B	C	D
Freedom from weed seeds		35				
Noxious weeds	(25)		25	25	0	25
Common weeds	(10)		0	10	10	10
Freedom from mixture		25				
5% or greater	(10)		10	10	0	10
Another variety	(10)		10	10	10	10
Other crop seeds	(5)		0	5	5*	0
Soundness		30				
Freedom from:						
Weathered, musty, heat-damaged and diseased kernels	(10)	10	10	0	10	10
Cracked or broken kernels	(10)		5	0	10	10
Insect damage	(10)		10	10	10	10
Freedom from inert material: dirt, stems, and chaff	(10)	10	10	0	10	0
TOTAL		100	80	70	65	85

Team No. IV Club Ranchers 4-H

Name John Smith

Placing | D | A | B | C |

*Noted, but not scored down because problem not serious.

HAY JUDGING

Skillful hay judging, like cereal judging, requires many hours of study and practice. The beginning member should not be expected to be a commercial hay grader. He should be acquainted, however, with the main characteristics that combine to produce a good hay. He also should be able to recognize and evaluate these qualities in a class of hay.

It is true that University of California scientists have shown that chemical analysis of hay is a useful method of determining the true value of a forage. Such chemical analyses involve determinations of the moisture, fibre, protein, and TDN (total digestible nutrients) content. Using the current value of barley and cottonseed meal and the relative content of the above substances, the true value of hay can be calculated. However, being able to evaluate hay skillfully by sight (judging) is still a very valuable asset to the seller and the buyer of hay. This ability should be learned as early as possible.

Alfalfa is the most common forage used in hay judging; therefore, it is used in this discussion. The outstanding characteristics of a good hay are leafiness, green color, percentage of foreign material, and soundness or condition.

Score card for alfalfa hay is as follows:

Class _____

SCORE CARD FOR ALFALFA		A	B	C	D
Leafiness	45				
Color	25				
Soundness and condition	20				
Freedom from foreign material	10				
TOTAL	100				

Team No. _____ Club _____

Name _____

Placing | | | | |

CHARACTERISTICS TO LOOK FOR IN JUDGING HAY

1. Leafiness

This refers to the percentage of leaves in the hay sample. The beginning member should remember that at least one-fifth of the leaves should remain clinging to the stem. A smaller percentage of clinging leaves indicates a very dry hay or improper handling of the hay before or during baling. When the hay is too dry, many of the leaves are lost and the quality is reduced. Leaves contain up to 75% of the nutrients in alfalfa.

2. Color

The ideal green color would have no discoloration from maturity, sun bleach, dew, rain or other damage. Color, for the beginning member, will be a comparison of the hay samples with each other for intensity of green color.

3. Soundness and condition

The contestant should keep in mind also that any of the following undesirable characteristics will greatly reduce quality. If hay is hot, wet, musty, moldy, caked, badly broken, badly frosted, overripe, very dusty, undercured, has any objectionable odor, or otherwise is of distinct low quality, it should be placed at the bottom of the class, because any or all of these in combination seriously detract from the feeding value of hay.

4. Freedom from Foreign Material

Foreign material should never exceed 15 per cent by weight. It includes common weeds, lovegrasses, cheatgrass, coarse sedges and rushes, overripe grain hay, cornstalks, grain straw, stubble, chaff, and other objectionable matter which occurs naturally in hay. No. 1 hay contains 5 per cent or less foreign material; No. 2 contains 5 to 10 per cent; No. 3 contains 10 to 15 per cent; and sample grade, 15 per cent or over.

Injurious foreign material includes any of the following, singly or in combination: sandburs, poisonous plants, harsh-bearded grasses, mature ripgut or bronco grass, and other matter, such as metal, which is injurious when fed to livestock. More than a trace of any of the above materials will greatly reduce the quality of the hay and put the hay sample at the bottom of the class.

Alfalfa hay that contains 5 per cent or less of properly cured grain hay or desirable grasses is not penalized for this fact. It may reduce color and should be judged accordingly.

SUGGESTIONS FOR SETTING UP A CLASS OF ALFALFA HAY

The beginning member should be taught how properly to identify and evaluate the basic qualities that combine to produce a good quality hay. In the beginning, assemble easy judging classes that will teach the member to recognize these grading factors. Official USDA graded samples usually can be borrowed from your local farm advisor. The locally constituted classes should not be made too difficult for the early training session.

If it is necessary for a member to identify injurious foreign material in the samples, it is advisable to have a representative sample of the foreign material for him to refer to during the early training sessions. It is well to acquaint the member with two or three new materials or plants at every training session.

With a little imagination, the difficulty of the judging samples can be increased and the 4-H members kept interested in judging alfalfa hay.

A typical alfalfa class could be judged as follows:

	A	B	C	D
Leafiness:	2d	1st	2d	3d
Color:	1st	2d	3d	3d
Foreign material:	none	3%	1%	none
Injurious foreign material:	Sandbur			
Soundness and condition:			Musty	

Having placed the hay samples individually for the various characteristics, the contestant will then have to go back and give these qualities a numerical value.

The numerical score card for these individual placings could look like this:

Class Alfalfa Hay

SCORE CARD FOR ALFALFA		A	B	C	D
Leafiness	45	30	45	30	20
Color	25	25	20	15	15
Soundness and condition	20	20	20	--	20
Freedom from foreign material	10	--	--	5	10
TOTAL	100	75	85	50	65

Team No. II Club Rancheros 4-H

Name John Smith

Placing				
	B	D	A*	C**

*A - Placed 3d because of sandbur

**C - Placed 4th because it was musty and poor quality.

SILAGE JUDGING

Silage is becoming an increasingly important crop in California. Silage judging is based upon visual and sensory (taste and odor) qualities. The score card below lists the characteristics that a contestant should look for in judging a class of silage. The same score card may be used in judging silages made from corn, alfalfa, clover, cereals, and sudangrass.

Class _____

SCORE CARD FOR SILAGE		A	B	C	D
Odor	26				
Stage of growth and foreign matter	20				
Moisture content	20				
Taste	16				
Texture (Feel)	12				
Color	6				
TOTAL	100				

Team No. _____ Club _____

Name _____

Placing | | | | |

CHARACTERISTICS TO LOOK FOR IN JUDGING SILAGES

1. Odor

Odor is the most important characteristic of silage. Initially, even desirable odors may be offensive to the beginning member. For this reason, the member should try and become familiar with desirable silage odors as soon as possible. Desirable odors should remind the contestant of fruits, cheeses, or meadows. Grass silage will have a stronger acid (vinegar) odor than corn silage.

In the beginning, members might possibly concentrate on identification of the more undesirable odors. These are similar to fresh leather, sweaty leather, soft cheeses, fish, and manure. They are increasingly objectionable in the order listed.

2. Stage of Growth and Foreign Matter

This is very important as it determines to a large extent, particularly in corn silage, the "feeding value" of the silage. Corn silage with a high grain content makes livestock feed superior to corn silages with little or no grain. **Corn silage is best when the kernels are well dented, well filled, firm, and somewhat hard on one side.**

Hay silage includes alfalfa, clovers, cereals, and sudangrass. Alfalfa should be harvested prebloom to early bloom; clovers in early bloom, and sudangrass and other forage sorghums in the soft-dough stage. The most common cereals, oats and barley, should be harvested in the dough stage.

Weeds and stubble will reduce quality and yield of total nutrients per acre.

3. Moisture

Moisture in judging silages can be determined by squeezing a small handful of silage. If juices come freely, then it is too wet. If very little moisture is discernible, then the silage is too dry. If your hand is moist after squeezing, the silage should be in the proper moisture range.

4. Taste

Tastes are sensed only on the tongue. The four tastes: sour, salty, bitter, and sweet, decrease in importance in this order. Sourness is desirable in any silage. Saltiness and bitterness in legumes is natural and proper. No taste at all is objectionable and indicates poor silage.

5. Texture (Feel)

A firm but soft, uniform feel is best. Stickiness is good usually, but a soggy, slimy silage (which often goes with no taste) is objectionable. Big, woody stems, spines, or sharp stiff ends are undesirable.

In judging silage, one should feel the samples; this is not necessary in grain judging. Be careful to put the material back into the right container to avoid mixing the judging samples.

6. Color

The closer the silage color is to the original crop, the better it is. Clovers darken more than other legumes. Most silages, with the exception of legumes, are harvested at a rather mature stage, so some bleaching should be expected.

SUGGESTIONS FOR SETTING UP A SILAGE CLASS

Beginning silage classes should be selected so that the members will have little difficulty in recognizing and learning to identify the characteristics they are looking for. To teach taste and odor, give the members a desirable example for reference. From the start, members should be encouraged to taste the samples, since this is an important characteristic and should be judged properly.

Silage can be exhibited best in an open-faced receptacle. In addition, an identical sample in a plastic bag containing about 5 pounds of silage should be placed directly behind the open sample. The sample in the plastic bag allows the member to judge odor and moisture more easily.

At first, classes should be easy enough so that point values should not have to be used in judging the sample.

A beginning corn silage class could be judged like this:

	A	B	C	D
Odor	None	Best	Good	Sweaty leather
Stage of growth and foreign matter	No grain	High % Dented grain	High % Non-dented	Low % grain
Moisture content	High	Good	Good	Low
Taste	None	Sour	Sour	Salty
Texture (Feel)	Slimey	Soft	Soft	Hard spines
Color	Brown	Bleached	Green	Bleached

This class would be placed:

B	C	D	A

In the advanced classes, the samples can be selected closely enough to require numerical values. They could be judged as follows:

	A	B	C	D
Odor	3d	2d	1st	3d
Stage of growth	4th	1st	2d	3d
Moisture	3d	1st	1st	4th
Taste	1st	1st	1st	2d
Texture	2d	3d	1st	2d
Color	1st	1st	3d	2d

Using the same technique that has been developed for judging hay, now have the members give numerical values to these placings.

The score card for this class would look like this:

Class Corn Silage

SCORE CARD FOR SILAGE		A	B	C	D
Odor	26	15	20	26	15
Stage of growth Maturity and foreign matter	20	10	20	18	15
Moisture content	20	10	20	20	5
Taste	16	16	16	16	10
Texture (Feel)	12	10	5	12	10
Color	6	6	6	2	4
TOTAL	100	67	87	94	59

Team No. IV Club Ranchers 4-H

Name John Smith

Placing | C | B | A | D |

This manual has been prepared to encourage interest in learning to recognize and identify desirable characteristics of these important agronomic crops. Only interest and practice are necessary to make members more competent and judging contests more enjoyable.

Here's how UCAES 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 IRRIGATED PASTURE RECORD

CLUB_____ RECORD YEAR_____

NAME_____ ADDRESS_____

DATE OF PLANTING_____ SOIL_____ ACRES_____

WATER SOURCE: Gravity_____ gals./min._____ Pumped_____ gals./min._____

RECORD OF PASTURE USE IN ANIMAL UNIT MONTHS

MONTH	CATTLE	HORSES	SHEEP	SWINE	*HAY CUT	A.U.M.	PER ACRE
September							
October							
November							
December							
January							
February							
March							
April							
May							
June							
July							
August							

*Two animal unit months per ton.

ANIMAL UNIT CONVERSION TABLE

	ANIMAL UNITS		ANIMAL UNITS
Cattle, over 2 years of age	1.00	Sheep, mature	.20
Cattle, 1–2 years	.75	Lambs, 40–100 pounds	.15
Calves, 3 months–1 year	.50	Horses, mature	1.00
Swine, mature	.50	Horses, 1–2 years	.85
Pigs, 40–100 pounds	.25	Colts, under 1 year	.40
Pigs, 100–200 pounds	.40		

SUPPLEMENTAL FEED

KIND	QUANTITY	TOTAL COST

LABOR, MAN AND EQUIPMENT

MONTH	JOB	MAN HOURS	COST PER HR.	EQUIP. HOURS	COST PER HR.	COST PER ACRE	TOTAL COST

RECORD OF MATERIAL AND LABOR

WATER BY MONTHS	GALS./MIN.	HOURS RUN	TOTAL QUANTITY	TOTAL COST	QUANTITY PER ACRE	COST PER ACRE

FERTILIZER

MONTH	KIND	TOTAL QUANTITY	TOTAL COST	QUANTITY PER ACRE	COST PER ACRE

SEED, etc.

KIND	QUANTITY	TOTAL COST	QUANTITY PER ACRE	COST PER ACRE

STOCK INVENTORY

(Use ages given in Animal Unit Conversion Table)

AGE	BEGINNING		END	
	No.	Av. Wt.	No.	Av. Wt.

COMPUTATION OF GAIN FOR STOCK ON PASTURE

NO.	POUNDS	VALUE/POUND	TOTAL VALUE
Total out			
Total in			
Net gain			
Plus died			
Total gain			

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.

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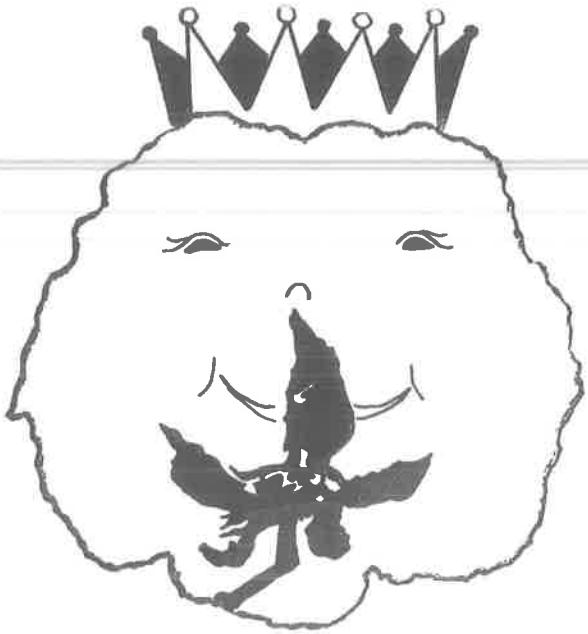
4-H FIELD CROPS MANUAL

Cotton Project

UNIVERSITY OF CALIFORNIA AGRICULTURAL EXTENSION SERVICE

4-H–Ag3

King Cotton



Every day in the world around you, cotton products are used in many ways—the clothes you wear, some foods you eat, and many other "everyday" items. Drapery, furniture, and upholstery manufacturers use many tons of cotton yarns each year. Large amounts of protein for livestock feeding come from cottonseed products.

You, as a 4-H member with a cotton project, will have an opportunity to learn to produce cotton. You will get to help plant and care for California's leading field crop. You will learn how to plant, cultivate, irrigate cotton, and how to identify cotton insects. You will also learn that plants properly cared for, will grow and produce an abundant harvest. You will learn how cotton is ginned, graded, and marketed.

Cotton production in California is a big business. This state leads all others in yields of cotton per acre. This is your opportunity as a 4-H member to "cash in" on "KING COTTON."

"Learn by Doing"

Below are listed some of the important steps in cotton production. In your 4-H COTTON PROJECT, acquaint yourself with these tasks:

- Pre-planting and Soil Preparation
- Pre-irrigation
- Fertilizers
- Planting and Thinning
- Irrigation
- Weed Control
- Insect Control
- Defoliation
- Harvesting
- Marketing

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DECEMBER 1963-1M Rerun

Requirements

Cotton projects can be grown only on farms with existing cotton allotments.

FIRST YEAR: Your first cotton project should include ½ acre or more of cotton. You are expected to keep a 4-H crop record and a labor record. You may exhibit any of the following items at the local or district fair:

Two cotton plants
Two pounds cotton seed
Twenty cotton bolls
Two pounds seed cotton

ADVANCED: You should expand your acreage, if possible. You are expected to keep labor, yield, and sales records. You may wish to conduct a test plot in cooperation with your Farm Advisor. Learn to grade and classify cotton. If possible, you should exhibit at the local fairs.

Soil Preparation

SHREDDING: Cotton production begins as soon as the old crop is harvested.

As soon after harvesting as possible, begin shredding old crop stalks and weeds. This old crop residue is shredded and disked under so it may begin to decay. Small micro-plants, in the soil called bacteria, eat the shredded material. The bacteria break these materials into smaller and smaller parts.

Decay will be quicker if the old crop residue is finely chopped. This helps because in the spring the trash will be decayed and will not interfere with planting.

SEED BED PREPARATION: When stalks are shredded and disked under, it is time to plow the ground. Cotton ground is plowed to turn under old crop residue, to loosen the soil and to help it take more water.

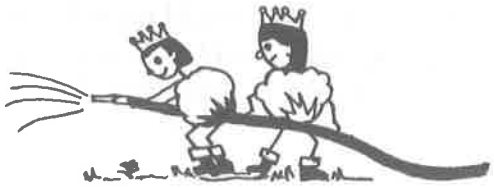
There are many ways to plow cotton land. Farmers use a breaking plow, middle buster, one-way or two-way disk, or combinations of these tools.

Where water penetration is a problem, ripping is quite often used. Where soil is ripped, it usually pays to go 20–32 inches deep. The soil should be fairly dry to cause a shattering of the compacted layers.

Most soils will need to be land planed every three or four years. Many times, this is done between crop rotations.

WORD OF CAUTION: Never work soil that is wet, or work land more times than necessary to accomplish the intended purpose!

Pre-irrigation



SOIL AUGER

Cotton soil needs to be pre-irrigated. Wet the soil 4 to 6 feet deep. Use a soil tube or auger to check and see if the soil is wet deep enough.

Pre-irrigation water can be sprinkled, flooded, or applied in an irrigation furrow.

Plenty of time should be allowed between pre-irrigation and planting time. Soil should be moist but not wet when planted.

Fertilizers

FEED YOUR COTTON. A cotton plant requires food! Just as animals, cotton plants have to be fed for top production. About 90% of dry matter produced by growing plants comes from the air and water, and 10% from the soil. You have no control over what nature supplies from the air—you CAN control plant foods available in the soil by adding fertilizer.

Scientists have found that fifteen plant foods are needed for growing plants. Valley soils usually have enough plant foods except nitrogen, sometimes phosphorus, and rarely potassium.

Nitrogen is the plant food most often applied to soils for cotton production. In the San Joaquin Valley, plant scientists and cotton farmers have found that 50 to 160 units of NITROGEN (300–750 pounds ammonium sulfate) should be applied for 2- to 3-bale cotton yields. Nitrogen can be applied to the soil in a dry, liquid, or gaseous state.

Phosphorus has increased yields on some San Joaquin cotton soils. Consult your Farm Advisor or leader for help with your fertilizer program.

Fertilizers should be placed 4 to 6 inches to the side, and 2 to 4 inches below the level of the planted seed. Nitrogen fertilizers will injure and sometimes kill young cotton plants if placed too close, especially during hot weather when the soil is dry.

Fertilizers should be applied very soon after planting. Experience has shown that on most soils one application is as good as a split application. On very sandy soils, it may be profitable to apply a split application—one at planting time and one application when the cotton begins squaring. Fertilizers should not be applied after the first of July.

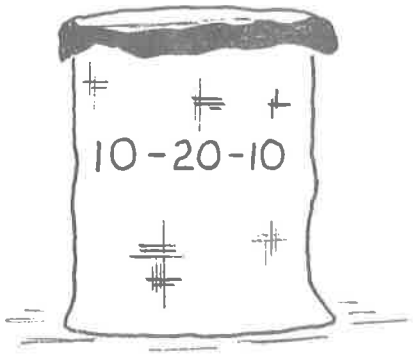
FERTILIZER FACTS: N, P, and K, are the symbols for nitrogen (N), phosphorous (P), and potassium (K). All fertilizers sold are required by law to clearly show on the bag the percentages of N P K.

Example: The first number always means the percentage of N, the second the percentage of P, and the third the percentage of K.

Most dry fertilizer is purchased in 80-pound bags.

PROBLEM: How many pounds of nitrogen (N), how many pounds of phosphorous (P), and how many pounds of potassium (K), would there be in a bag (80 pounds) of:

SOLUTION: 10% of 80 lbs. would be nitrogen (N)
10% of 80 lbs. = 8 lbs. nitrogen



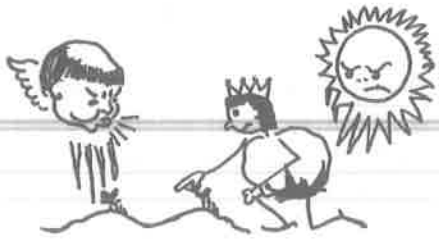
20% of 80 lbs. would be phosphorous (P)
20% of 80 lbs. = 16 lbs. phosphorous

10% of 80 lbs. would be potassium (K)
10% of 80 lbs. = 8 lbs. potassium

SOIL POINTERS: Soils have two conditions: chemical and physical. Chemically, soils are improved by the addition of fertilizers; physically, soils can be improved by crop rotations and tillage. Alfalfa is one good crop in rotation with cotton. Barley, corn, and grain sorghums are also very good.

Physical condition of soils is as important to high cotton yields as chemically fertile soils. A good physical soil will hold much water and air, and be loose for plenty of root space.

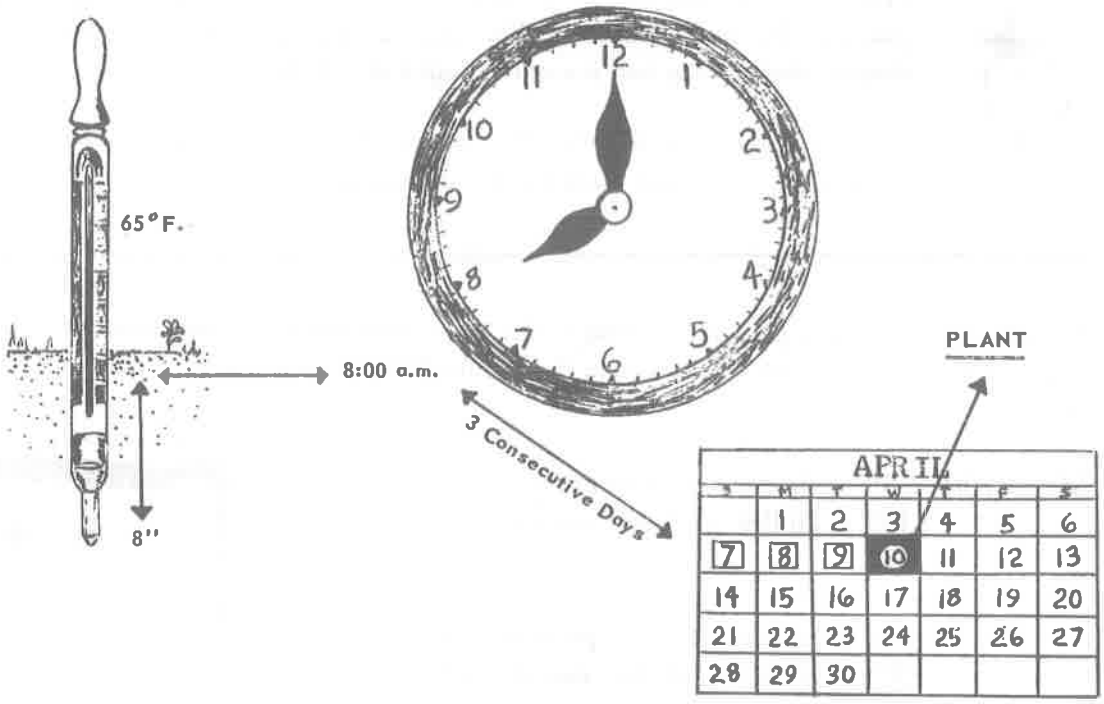
Planting



Inside a cotton seed is a small embryo waiting to grow into a healthy cotton plant. If supplied with moisture, oxygen, and **correct** temperature, this embryo will begin to grow and burst out of the soil.

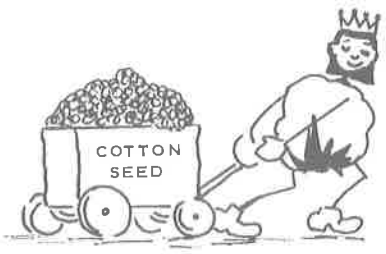
Time of planting cotton will vary from year to year, depending on the weather, temperature, and location. Usually, cotton in the San Joaquin Valley is planted from the last of March in the southern part of the valley, until the first of May in the northern part.

A good rule of thumb to follow is to delay planting until the soil temperature is 60° to 65° F. at an 8-inch depth for two or three consecutive days. Cotton planted in cold soil is often attacked by many seedling diseases. Take temperature readings at 8:00 a.m.



Cotton is a warm-season crop. Many times, cotton planted when soil is warm, outyields earlier planted cotton.

Depth of planting will be determined by **soil texture** and **moisture condition** of the soil. Plant only deep enough to insure adequate moisture for germination. Usually 1½ to 2 inches should be deep enough on most pre-irrigated soils. Moisture can be conserved if the seed is planted in a narrow furrow, and soil packed with a press wheel.



HOW MUCH SEED TO PLANT?

Usually 12 to 25 pounds of delinted seed will insure a good stand. Research and farm experience has shown little yield differences if plants are spaced from 4 to 9 inches apart down the row. Adequate and uniform stands are important to profitable cotton production.

There are many items to consider when planting cotton. If you plan to machine harvest, to machine thin, or if you have sandy soils, you should consider planting more plants per acre. If you follow a fertilizer program that promotes rank growth, you should consider reducing the number of plants per acre.

Most cotton is planted on 38- or 40-inch rows.

20,000 PLANTS/ACRE OR 50,000 PLANTS/ACRE

ON 40-INCH ROWS

TREATED SEED. Plant seed treated with recommended fungicides. Scientists are busily brewing up new chemicals to combat seedling diseases. As soon as one chemical is tried, proven, and put into use, they come up with a new one that is usually better.

Before purchasing seed, always check with your 4-H leader or Farm Advisor for seed treatment recommendations.

Irrigation

WHEN TO IRRIGATE—DIFFERENCE BETWEEN PROFIT AND LOSS! Timely irrigations that wet the soil to a depth of 5 or 6 feet often insure high cotton yields. Improper irrigation practices most surely will result in a poor crop.

Proper pre-irrigation should supply plenty of moisture until the cotton plants are up and cultivated.

HOW TO IRRIGATE—Different amounts of water will be required, depending on soil texture, temperature, locality, humidity, length of day, and size of cotton. The cotton plant is a good indicator. When beginning to dry, and before wilting, the cotton plants will turn a dark blue-green in the heat of the day.

During July and August the temperatures are high—humidity low. The cotton at this time is growing very fast, and is at the peak of its flowering and fruiting stage. Water use is high.

Cotton plants should never be allowed to wilt. Nearly all fields will have sandy or light areas. Check these areas for indications of wilt. When these spots begin to wilt, it is usually time to start the next irrigation.

It would be impossible to give recommendations for all areas in this publication. You, as a 4-H member, will "LEARN BY DOING."

Learn:

- **How much water to apply to your soil each irrigation.**
- **Depth that water will go in the soil.**
- **How long between each irrigation as the season progresses.**
- **How very important it is to do a good job and do it often.**

Some things you can do to help you grow more and better cotton:

A. Use soil auger or tube to check moisture at different depths before you irrigate.

B. Use a soil auger or tube and check different locations in the field to see how deep water has penetrated after you irrigate.

C. Watch the drier parts of the field as an indicator when to irrigate the cotton.

DRAINAGE. Only rice grows under water. As equally important as irrigation is drainage. Water standing at the end of a field is a good thing for mosquitoes, but hard on cotton! This is a good place for grass and weeds to take over. Water is very short in most locations in the San Joaquin Valley, and it is everyone's responsibility to conserve it.

Many farmers construct their drainage system so that the water is reused. Water is sometimes collected in a drainage pond and pumped back into a pipeline.

Weed Control

WEEDS ROB YOU OF WATER AND PLANT FOODS.

Any plant other than a cotton plant in a cotton field is a weed! Weeds can be controlled by cultivating, chopping, burning, eating (geese), or spraying with chemicals.

Cultivation can be very effective in controlling weeds. Cultivation should be shallow. Soils rapidly dry out to whatever depth stirred. Rotary hoes are very good on young cotton. The spines on the rotary hoe flip young shallow-rooted weeds out of the soil. This operation has to be done at fairly high field speeds to be most effective; that is, 5 to 7 miles per hour on most soils. This also leaves the soil in a good loose condition for following cultivations.

About 2 weeks after cotton comes up (fourth-leaf stage) soil can be worked up next to the plants to cover small weeds. The rear shovels (or sweeps) should be set at this time so that a shallow furrow is present. As the cotton grows larger, more and more soil can be worked around the cotton plants.

Soon after the first irrigation, cultivate to keep down weeds and maintain the irrigation furrow. Late cultivations should be very shallow so as not to damage the rooting system.

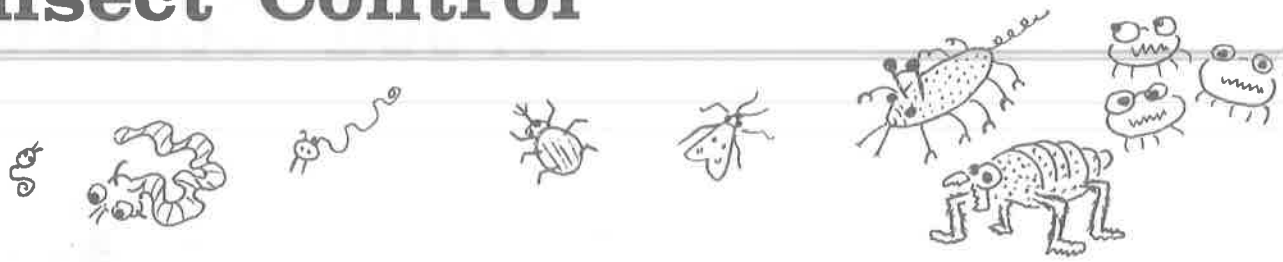
Some weeds usually escape cultivation and must be destroyed with the hoe. The better you use the hoe, the better job your next cultivation will be. Hoeing can serve two purposes: weeds can be removed, and the cotton thinned at the same time.

Burning is a very successful but not a readily accepted method of weed control. Shielded directional flame is directed toward the soil next to the cotton plants, and destroys young grass and weeds. Research has shown that burners properly used, are harmless to cotton plants and quite effective as a weed killer.

Geese are used to control grass in cotton, and do a very effective job if properly managed. Cost of maintaining geese is high, dogs are often a problem, and fencing is required.

Chemical weed control is becoming more widely used. Dalapon has been proven very successful in controlling Johnson and Bermudagrasses. Some of the newer chemicals such as diuron can give early, as well as late weed control in cotton. This is a time when cultivation is difficult.

Insect Control



Good farming practices are important in insect control. Field cleanup (shredding, turning under crop residue) after harvest is important. Many insects over-winter in old crop residue. Chemical insect control is not a substitute for good farming practices.

Each year, entomologists from the University of California publish a Pest Control Program for Cotton. Latest control recommendations are given in this pamphlet. Failure to control cotton insects can be disastrous in obtaining good yields.

After cotton comes up, it should be checked every 5 to 7 days for insect damage. For further information, contact the Farm Advisor's office.

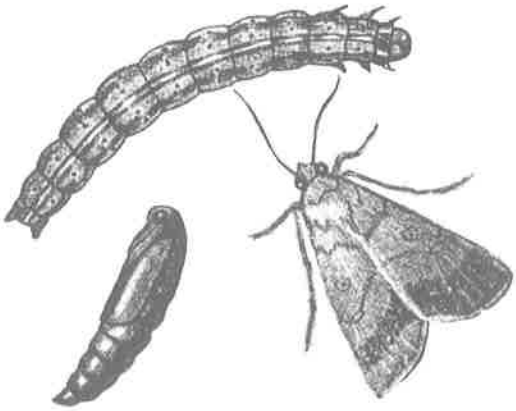
Below are listed some of the insects causing damage to San Joaquin Valley cotton:

BOLLWORM (*Heliothis armigera* Hbn.) is a major cotton pest. The tiny newly hatched worm first feeds on leaves and then attacks squares and bolls. Greatest loss is caused by tunneling into and destroying bolls. The color varies from pink, green, to almost black. The full-grown worm, about 1½ inches long, enters the ground and becomes a mahogany-brown pupa from which the adult later emerges. A generation may be completed in 30 days during warm weather, with four to six generations annually. Control should start as soon as eggs and newly hatched worms are found.

The adult is a yellowish to brownish moth (often with a strong greenish overcast which fades in flown specimens) with a wing spread of about 1½ inches. The female lays about 1,000 eggs singly, particularly on growing tips, squares, and bolls. The small, ribbed eggs are white, dome-shaped, and about half the size of a pinhead.

LYGUS BUGS (*Lygus elisus* Van D. – *Lygus hesperus* Knight) are important pests of cotton in the Southwest. Alfalfa is a favorite host of these insects. When alfalfa or other plants are cut or dried out, lygus bugs migrate to adjacent cotton fields. Their feeding on cotton results in the shedding of squares, blooms, and young bolls. The plants also become deformed.

The adult females are straw-colored while the males are darker with red and brown markings. They are almost ¼ inch long, slightly smaller than the tarnished plant bug. Eggs are laid within the tissues of the plants upon which they feed. Under favorable conditions, a generation may be completed in 30 days. There may be six or more generations in a season.

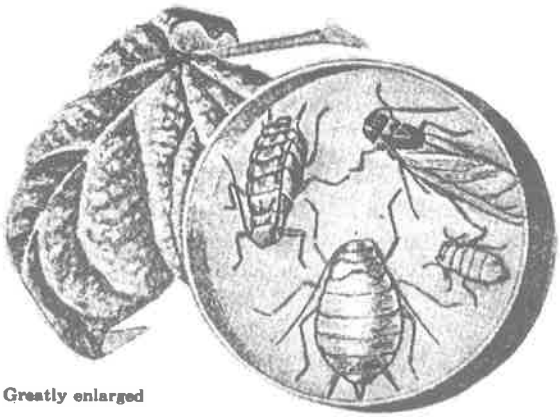


Approximately 2 times actual size

BOLLWORM
Heliothis armigera (Hbn.)

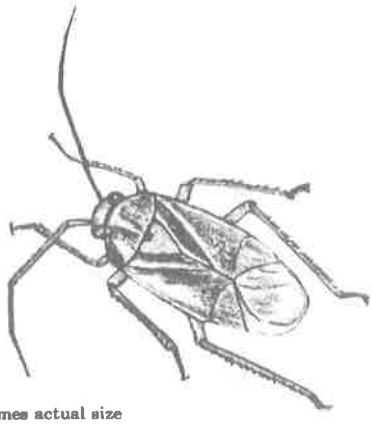
Greatly enlarged

TWO-SPOTTED SPIDER MITE
Tetranychus bimaculatus Harvey



Greatly enlarged

COTTON APHID
Aphis gossypii Glov.



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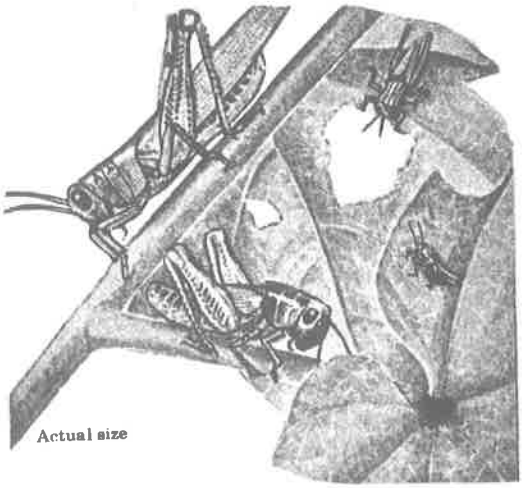
LYGUS BUG
Lygus elisus Van D. *Lygus hesperus* Knight



Actual size

DIFFERENTIAL GRASSHOPPER
Melanoplus differentialis (Thos.)

COTTON APHID (*Aphis gossypii* Glov.) is a common species of plant louse, which feeds on cotton and many other plants. It is a small, soft-bodied, sucking insect, varying in color from light yellow to almost black. In the South, females give birth to living young throughout the year. During hot weather, a generation may be completed in a week's time. Most adults are wingless, but sometimes winged forms appear.

The aphids usually feed on the undersides of leaves and on stems. Injury to cotton may first occur on seedling plants in cool weather, deforming, stunting, or even killing the young plants. Later, heavy infestations may cause shedding of leaves and a marked decrease in yield. The aphids' sticky secretion, called honeydew, drops on open bolls, staining lint and lowering the grade. Many natural enemies, including lady beetles, aid in keeping aphids in check.

DIFFERENTIAL GRASSHOPPER (*Melanoplus differentialis* Thos.) attacks all kinds of crops, including cotton. When abundant, they may destroy thousands of acres of cotton or other crops in a community.

There are many species of grasshoppers. The differential grasshopper is probably the most important attacking cotton. The adult insect ranges in length from 1½ to 2 inches. It is brownish-yellow, often tinged with olive-green. Hind legs have distinct V-shaped bars on outer sides.

Eggs are laid in pods in the ground during late summer or fall, usually in fallow land, in pastures, or on turn rows. When hatched in the spring, the young grasshoppers feed first on grass and weeds, and then transfer to field crops. Control should be started while hoppers are small, and before migration to field crops occurs.

TWO-SPOTTED SPIDER MITE (*Tetranychus bimaculatus* Harvey) is one species of a group generally known as spider mites. When leaves of the cotton plant become blotched with red or yellow spots, the presence of these mites may be indicated. Heavy infestations often result in the leaves turning a rusty, brownish (or red) color, later shedding from the plants. Sometimes, squares and bolls shed also.

Spider mites are barely visible to the naked eye. They may be red, reddish-yellow, yellow, or greenish. The mites are found on the undersides of the leaves where they suck the sap of the plant, spin filmy webs, and lay their eggs. They have a number of generations each year. Besides cotton, spider mites attack almost 200 other plants. Hot, dry weather is most favorable for outbreaks. Heavy rains may effectively check them.

Defoliation

Only jobs that return more than cost should be considered in cotton production. Sometimes defoliation may be beneficial.

By applying chemical defoliants, a cotton plant can be induced to shed its leaves. Cotton may be defoliated for the following reasons:

- To reduce boll rots and speed drying
- To help lodged plants straighten up
- To reduce populations of damaging insects
- To improve cotton grades
- To aid hand picking

Cotton defoliation is very effective on uniform soils low in nitrogen. The stand of cotton should be uniform and fairly thick with few weeds. When the defoliant is applied, the temperature should be high and the applicator should get complete coverage. The soil should be moderately moist, but not wet. The cotton should be mature and not growing.

A leaflet that gives the latest recommendations on the use of defoliants can be picked up at the Farm and Home Advisors' office.

Harvesting

Cotton can be harvested by hand picking or by machine. Harvest by the method that is most economical on your farm.

Cotton should be harvested when mature and dry. Avoid any excess trash in harvesting operations. Cotton should not be tramped because tramping breaks up the trash and it becomes harder to remove in the ginning process.

Marketing

When hauling cotton to the gin, carry enough to make 500-pound bales. About 1450 pounds of machine-harvested cotton will usually make 500-pound bale.

Cotton is ginned to remove the lint from the seed. The lint is moved into a press where it is compressed, bagged, and tied into bales. The seeds are usually sold to an oil mill to pay part of the ginning cost.

SOME GRADE NAMES USED FOR COTTON

Gray	White	Spotted	Tinged	Yellow Stained
	Strict Good Middling			
GM Gray	Good Middling	GM Sp	GM Tg	GM YS
SM Gray	Strict Middling	SM Sp	SM Tg	SM YS
M Gray	Middling + and Middling	M Sp	M Tg	M YS
SLM Gray	Strict Low Middling + and SLM	SLM Sp	SLM Tg	
	Low Middling + and LM	LM Sp	LM Tg	
	Strict Good Ordinary + and SGO			
	Good Ordinary + and GO			

The value of cotton is determined by its fiber (staple) length and grade. The better the grade and the longer the staple, the better the price per pound. Staple length is in inches and fractions of inches. Grade is expressed by the following terms:

- Strict Good Middling
- Good Middling
- Strict Middling
- Middling
- Strict Low Middling
- Low Middling
- Strict Good Ordinary
- Good Ordinary

Grade is determined by color, foreign matter and preparation. Preparation is how smooth, cut or tangled the fiber is after ginning. (Note: classification is determination of both grade and staple length.)

Samples are cut at the gin and sent to the Cotton Classing Office. Cotton is graded and staple length determined by employees of the USDA. Cotton in the United States is uniformly graded under the same system.

PESTICIDE RESIDUES

These suggestions for pest control are based on the best information currently available for each pesticide listed. If followed carefully, the suggestions should result in satisfactory control and should not leave residues that will exceed the tolerance established for any particular chemical. To avoid excessive residues on the harvested crop, follow suggestions carefully with respect to dosage levels, number of applications, and minimum interval between application and harvest.

Residue information for disease control is based largely upon data from the Pesticide Regulation Section of the United States Department of Agriculture, and other reliable sources.

THE GROWER IS RESPONSIBLE for residues on his crops as well as for problems caused by drift from his property to other properties or crops.

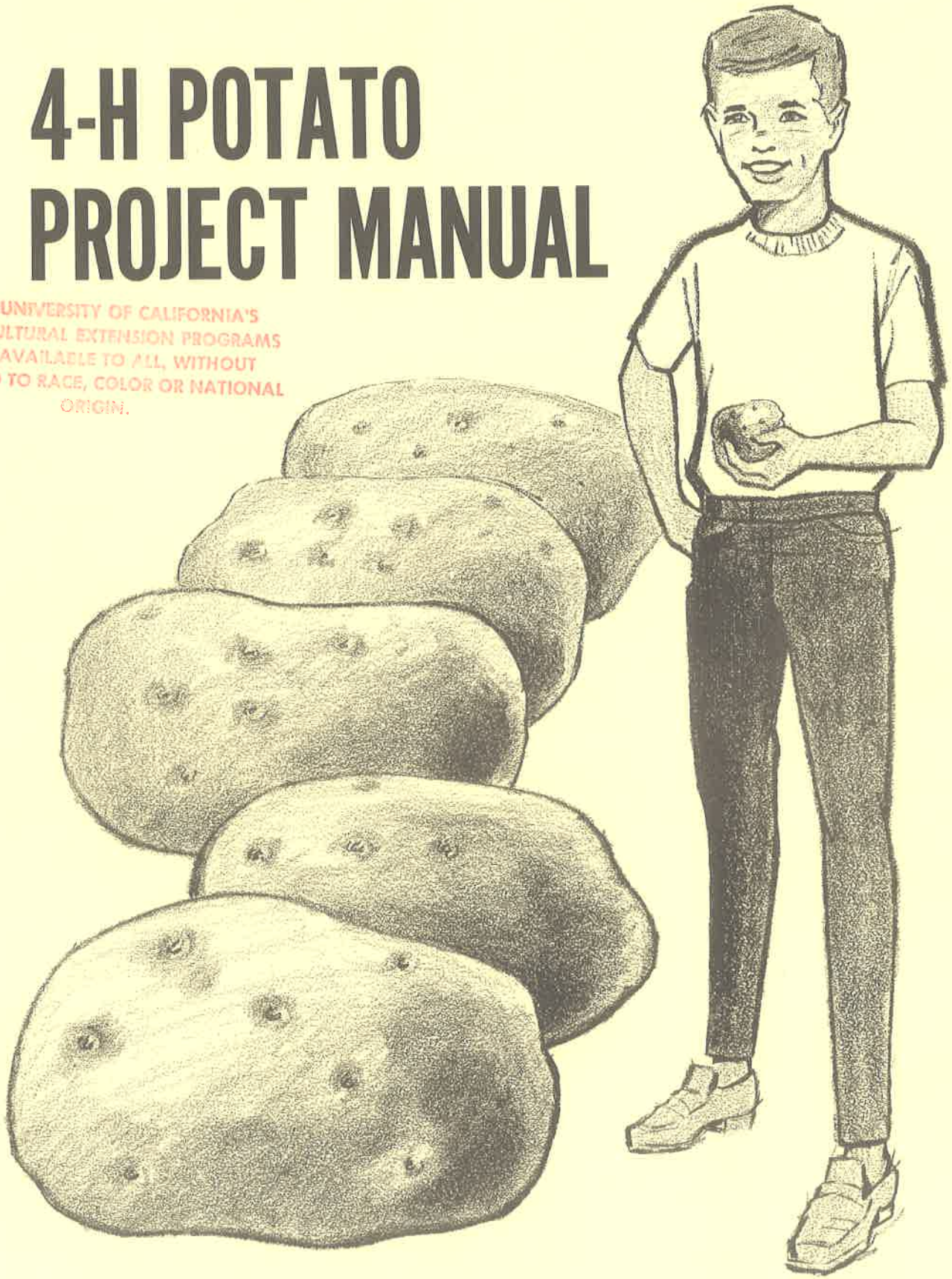
To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

The author is Jimmie R. Billington, Farm Advisor Madera County.

Cotton Acreage Quotas.

Cotton planting acreage is under government control. See your county ASC Committee office for information on cotton acreage allotments.

4-H POTATO PROJECT MANUAL



UNIVERSITY OF CALIFORNIA AGRICULTURAL EXTENSION SERVICE

4-H—Ag170

The authors are A. D. Aulenbacher, 4-H Club specialist,
and Phil Minges, former vegetable crops 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.

JUNE 1966--1½M Rerun

4-H POTATO PROJECT MANUAL

In this project you will have the opportunity to grow and market some white potatoes. You also will learn about fertilizing, irrigating, and other practices that will be useful to you in growing potatoes and other crops.

Potatoes are considered a cool season crop, but they must be grown during the part of the year when frost will not injure them. Ask your leader or farm advisor about planting dates and varieties for your particular area.

POTATO PROJECT REQUIREMENTS

Look ahead and be sure you know your project requirements before you start. All 4-H Club members are expected to meet the requirements given below.

BEGINNING UNIT

If you are 10 or 11 years old and this is your first 4-H Club project in crops, you should grow at least a 50-foot row of potatoes.

INTERMEDIATE UNITS

If you are 11 or 12 and this is your second project, you will be expected to grow two varieties of potatoes with at least 50 feet of row of each variety.

The minimum requirement for the third year project is 200 feet of row with two or more varieties and also two planting dates.

ADVANCED UNIT

When you have had 2 or 3 years' experience in the potato project, you are expected to expand into a commercial acreage of potatoes or take up another crop growing project. As you did in the intermediate units you should enlarge your crop project each year.

1. A minimum advanced potato project would be about ⅛ acre. You should double the size each year you continue it. Use the common potato machinery in your project.

2. You may wish to have a home garden project, starting with five or six crops in the first advanced year and increasing the number with future projects.

3. You may wish to have a market-garden project in which you will grow two or more vegetables for sale. Flowers might be grown in this type of project also.

4. You may prefer to grow a single vegetable crop other than potatoes on a commercial scale. The crop might be sold for fresh use or contracted to a processor for freezing or canning. Or, instead of a vegetable, you could select a field crop, fruit, or a flower crop.

5. You might like a specialized type project such as growing nursery stock, conducting a test plot type of project, or growing a crop for seed.

WHAT YOU WILL NEED

Now that you know what is expected of you in your 4-H potato project, you are ready to begin work. On the following pages you will find information on the land, tools, and materials you will need; some of the practices you will follow in raising and marketing your potatoes; and information on other activities your group can do in relation to your potato project. So that you can be more "expert" in telling your family and friends about your project, some interesting facts about potatoes are included.

AMOUNT AND LOCATION OF LAND

You will need about 150 square feet of land for the minimum first-year project. Four rows, 12½ feet long, will give you 50 feet of row. The usual row spacing for potatoes is from 32 to 36 inches apart. On this basis, a piece of ground 12 by 12½ feet will be enough, but you may want to allow an extra foot on each side for borders.

The location of this project is very important.

1. It should be near your home so that you can easily care for it.

2. Water should be available whenever needed.

3. The plot of ground should receive full sunlight during the day.

4. Avoid locations that will be shaded by large trees or buildings.

Sandy loam soils are preferred. You may grow potatoes on heavier soils, but the soil is harder to work and your potatoes may have a poor tuber shape.

SEED AND VARIETIES

Potato seed is not a true seed such as is used to plant most other crops. It is actually a small piece of the potato itself. It takes good seed to produce good crops, and potatoes are no exception. Always use "certified" seed if you can. Your leader may arrange for you to order your seed through him or through a local store. You will need 4 pounds for each 50 feet of row.

Be sure to order the proper variety. White Rose, Russet Burbank, Netted Gem, Pontiac, and Red LaSoda are the most common varieties grown in California. Kennebec is a new, high-yielding, good-quality variety used mostly by processors for the manufacture of potato chips and French fried potatoes.

Ask your leader which variety you are to grow in your first-year project and write it here:

_____

Indicate the varieties you will use for your second- and third-year projects here:

2d _____ and _____

3d _____, _____

and _____

FERTILIZER

In most parts of California, 16-20-0 mixture is a good fertilizer for potatoes. This means the fertilizer contains 16 per cent nitrogen, 20 per cent phosphorus pentoxide (or 8.7%P), and no potassium. Use 3 or 4 pounds of this fertilizer for each 50 feet of row. At 4 pounds per 50 feet of row, you will be applying 175 pounds of nitrogen per acre, which is the recommended amount.

Potassium is needed in some areas. A 10-10-10 mixture provides enough potash if applied at 6 pounds per 50 feet of row.

In a few areas a complete mixed fertilizer is desirable; in others, only straight nitrogen fertilizer is needed. Ask your leader which you should use.

What type of fertilizer will you use?_____

_____

How many pounds will you need for your second- and third-year projects?_____ and_____

What rate of N, P, and K is this per acre with 4 pounds per 50 feet of row?_____

_____

How will you apply the fertilizer?_____

EQUIPMENT

In your beginning 4-H project you will need a shovel, hoe, garden hose for irrigation, and a spading fork for harvesting. As your project enlarges, you may wish to get a small, hand wheel cultivator.

OTHER MATERIALS

You will need a fungicide for treating seed potatoes. Ask your leader for this material.

Tuber moth may be a problem in some areas. Aphids, leafhoppers, or various worms or foliage diseases may attack the foliage in some seasons. Consult your leaders or farm advisors on control materials that can be handled with safety.

WHAT YOU WILL DO

PLAN YOUR PROJECT

After you sign up as a 4-H potato grower, you should make plans. You should know where you will grow your potatoes and when you will do certain operations.

Indicate below the dates you expect to:

- ☐ Order your seed and fertilizer_____
- ☐ Prepare your ground_____
- ☐ Plant and fertilize_____
- ☐ Start irrigating_____
- ☐ Harvest your crop_____
- ☐ Market your crop_____

Put a check in the box to the left when you actually do what you planned. This will show the part of your plan that is completed.

PREPARE THE SOIL

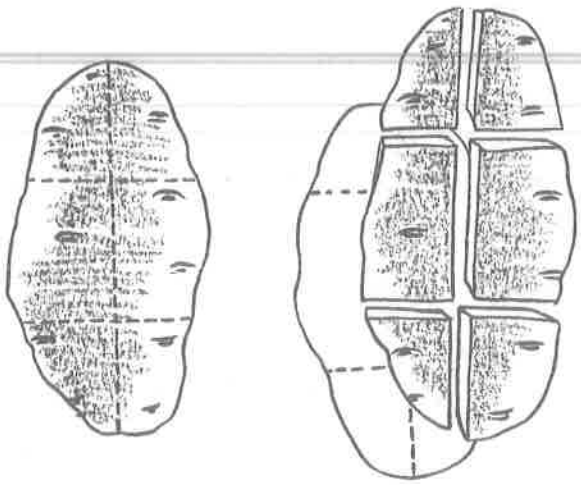
To prepare your soil for planting, spade it to a depth of 6 to 8 inches. At the same time, turn under all old crop residue or trash. If possible, do this several weeks ahead of planting to allow the organic matter time to start decaying.

Keep the weeds under control until you are ready to plant.

The ground should be moist at the time of planting. If winter rains were not adequate, you may have to moisten the soil by sprinkling or furrow irrigation a few days before planting.

PREPARE THE SEED

Just before you are ready to plant, cut the seed into proper seed-piece sizes and treat the seed to control certain diseases.



Cutting the seed. A potato seed piece should have at least one eye, which is the bud from which the new shoot will grow. It should weigh between 1 and 2 ounces. Ten seed pieces per pound will give 1½-ounce seed pieces.

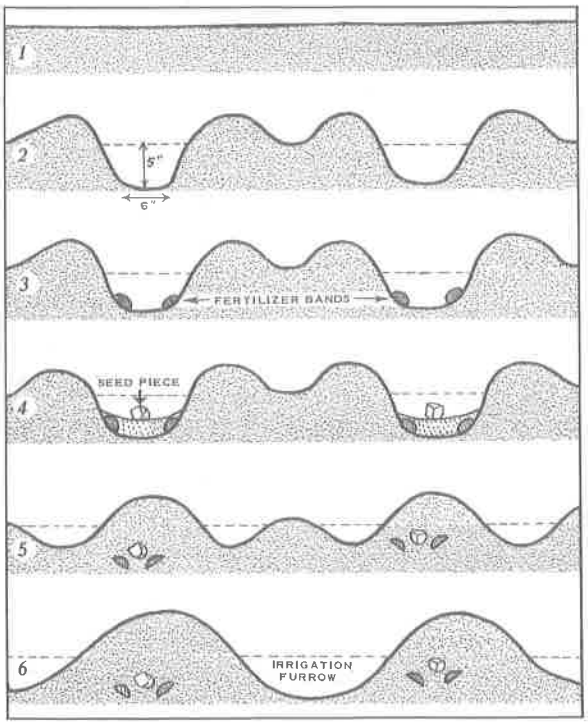
Very small potatoes may be used whole. Medium to small potatoes may be divided into two or three seed pieces. Large potatoes may be cut into six or more seed pieces. Medium-sized seed potatoes usually are the most economical and will plant the most area per pound.

Seed treatment. Here are some suggested chemicals for treating seed potatoes.

1. Semesan Bel - 1 pound to 7½ gallons of water. This can be used as a dip for either cut or whole seed if dried quickly or planted immediately.
2. Captan - 1 pound for each 10 gallons of water for dipping cut seed.
3. Captan Dust - Sprinkle captan dust over freshly cut seed so it is completely covered.

Note: Seed treatment may not be practical for 1st year. Remember, plant certified disease-free seed, if untreated.

PLANTING AND FERTILIZING POTATOES



PLANT AND FERTILIZE

1. Start with level soil.
2. With your shovel, make a U-shaped trench, 4 to 5 inches deep. If you have more than one row, space them about 36 inches apart.
3. Place a band of fertilizer 2 inches from the center on each side of the trench. For 16-20-0 you would use 2 pounds of fertilizer for each band per 50 feet of row.
4. Cover the fertilizer with a 2-inch layer of soil to protect the seed pieces from the fertilizer.
5. Place the seed pieces in the center of the trench, spaced about 10 inches apart.
6. Cover the seed pieces with 4 to 5 inches of soil.

Before plants come up, make final ridge and furrow.

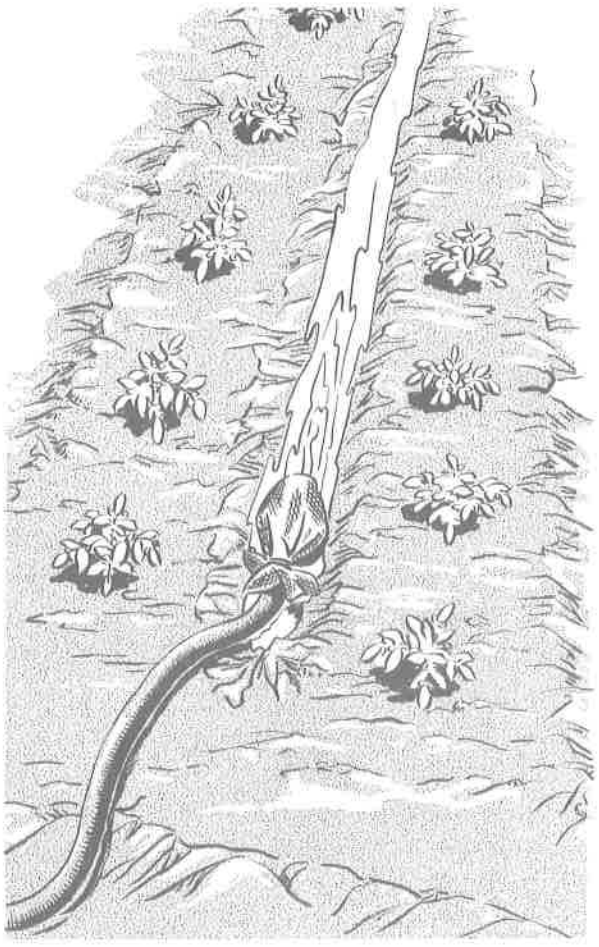
CULTIVATE AND RIDGE

Keep your potato patch free of weeds. It is best to do this when the weeds are very small. Weeding may be done with a small hand cultivator or by hoeing.

Make the final ridge just before the plants emerge. Add enough soil to provide at least 6 to 8 inches of soil over the seed pieces. Make the ridge wide enough so that the tubers will be covered later, to prevent greening.

A flat-topped ridge is preferable, and allows more room in the bed and better penetration of sprinkle irrigation water. The furrow made in this final ridging will serve for irrigation.

Raking the ridges lightly just before the plants emerge and then hilling with a hoe after emergence will help control weeds when they are small; this fits in with commercial methods of culture.



IRRIGATE

Proper irrigation is very important in producing good potatoes. The furrow or furrow-basin method usually is preferred for potatoes. But you can use a sprinkler system, if necessary.

Keep the soil in the rooting area moist at all times. If the soil is moist at planting time, it probably will not be necessary to irrigate until most of the plants emerge. A good soaking soon after the plants emerge usually will be sufficient for 2 weeks or more. As the plants get larger and the weather becomes warmer, you will need to irrigate more often.

Potatoes require from 24 to 40 inches of water during the growing season. This means you will have to irrigate oftener if you live in the warm interior valleys than you will if you live in the cooler coastal districts or mountain areas.

Many California growers irrigate potatoes by sprinklers. Sprinkler irrigation uses about half as much water as furrow irrigation. (A rule of thumb is 4 hours every 4 days with a $^{5}/_{32}$- to ¼-inch aperature in "Rainbird" sprinkler heads.) Continue sprinkling until the soil beneath the plants will hold in a "squeeze ball." If water stands on the surface, shut off the sprinklers. Alternate starts and stops until penetration reaches 1 foot in the row.

(Tensiometers or other soil moisture measuring devices can be used to determine when potatoes should be irrigated.) To measure the amount of water actually being applied by sprinkler, set 1-pound coffee cans at various places in the row.

Improper or infrequent irrigation is one of the biggest factors in producing rough potatoes.

Ask your leader what is the usual practice for irrigating potatoes in your district during the main part of the growing season. How often do you plan to irrigate after the plants have become established?_____

Stop irrigating 2 to 3 weeks before harvest to allow soil to dry out before digging.

HARVEST

Usually, potato vines begin to turn yellow and die when the crop is mature. At this time, most of the tubers are a good size and have a well-developed skin (periderm) which makes them resistant to skinning. In most areas, potatoes mature in 110 to 140 days after planting.

Handle potatoes carefully at harvest to prevent injuries. Pick into padded containers, pour carefully into sacks, and do not throw or drop the potatoes.

On small plots, potatoes can be harvested by hand. A regular spading fork is best, but a shovel can be used. Dig the potatoes carefully. To avoid cutting or otherwise injuring the tubers, keep the digging tool to the side of the hill and insert it deeply. When the weather is very hot, pick up the potatoes soon after they are dug and quickly remove them to a shady place. In cooler weather, it is all right to allow the potatoes to dry off for a while before picking them up. Be sure to record in your record book the weight of all potatoes harvested.

What date or dates did you dig your potatoes?

_____

How many days from planting to harvest?

_____

Did your second-and third-year projects take the same number of days from planting to harvest?_____

GRADE AND MARKET

Before you sell your potatoes, grade them carefully according to U.S. No. 1 regulations. Edible potatoes that do not meet the No. 1 grade can be included in a second or No. 2 grade. Cull or discard inedible and small potatoes.

Potatoes that meet U.S. No. 1 grade are 1⅞ inches in diameter or larger. They are relatively free of rots, disease, insect damage, and harvest injury. They also are fairly uniform in shape. Poorly shaped potatoes, such as knobby potatoes, are suitable for the second grade. Badly diseased or injured potatoes, or those showing a considerable amount of greening should be discarded as culls.

I had_____pounds of No. 1 grade potatoes, _____pounds of No. 2 potatoes, and _____pounds of cull potatoes.

Your neighbors or local grocery stores probably will be glad to buy any potatoes you have in addition to the amount you can sell to your family. You will find that it always pays to sell top quality potatoes in an attractive container.

If polyethylene or other tight bags are used, be sure there are at least 24 ¼-inch holes per bag. Potatoes deteriorate rapidly without air.

STORAGE

If you want to hold your potatoes a while before you use or sell them, the best storage temperature is between 40° and 50° F. The humidity should be fairly high and the potatoes should be protected against light. At higher temperatures, potatoes sprout quickly. At temperatures below 40°, they become sweet. At low humidity the tubers lose moisture and shrivel.

When you are holding potatoes for a special purpose such as for a future exhibit date, it may be desirable to wrap each potato in a piece of newspaper. This will help protect them against loss of moisture, temperature changes, and mechanical injuries.

Note to Leader

A copy of the U.S. Potato Grades may be obtained from the Bureau of Shipping Point Inspection, State Department of Agriculture, Sacramento.

RELATED ACTIVITIES

When you have a potato project, there are many related activities you can participate in with your group. These include exhibiting at 4-H and other fairs; judging plates or classes set up by your leader; developing and giving demonstrations to teach others the things you have learned; identifying different varieties of potatoes; identifying weeds, insects, or diseases that affect potatoes and other crops; and participating in grading contests set up by your leader.

If you are interested in exhibiting your potatoes at a fair, select the very best specimens at the time of harvest. For a plate of five specimens, select from 15 to 20 uniform, medium-sized potatoes in excellent condition. Wrap each one separately and store under good conditions until the time for the fair. At exhibit time, select the five very best uniform potatoes. You can find further ideas on exhibiting in the leaflet **How To Prepare Vegetables for 4-H Exhibits.**

When is your 4-H fair or exhibit day?_____

_____

Can you have an exhibit for it?_____

_____

What are the dates for your county fair?_____

_____

Can you exhibit there?_____

INTERESTING FACTS ABOUT POTATOES

White or Irish potatoes belong to the same family as tomatoes, peppers, and eggplant. The eggplant is the most closely related to potatoes.

The edible portion of potatoes is a modified stem called a tuber. The tubers grow on stolons (a kind of stem) which arise from the underground stem between the seed piece and the soil surface. Most of the eyes occur on the apical end, which is the farthest from the plant. The stem end (nearest the plant) has relatively few eyes.

There are more than 300 named varieties of potatoes. About 62 are grown in the United States. Eight varieties account for most of the production. Five of these were discovered before 1900. Three are newer varieties developed since 1900. The most important varieties are: (1) Katahdin, (2) Russet Burbank, (3) Kennebec, (4) Red Pontiac, (5) Red LaSoda, (6) Cobbler, and (7) White Rose.

Potato tubers turn green when exposed to the light. The green area is mildly poisonous and severe greening makes culls of the potatoes. Protect potatoes from the light before harvest by keeping them well covered with soil. After harvest, protect them from the light if they are to be stored for long.

Potato scab, ring rot, and several mosaic diseases are the common potato diseases in California. The best protection against diseases is to use certified seed obtained from a reliable source.

Common insects in California are the tuber moth and wireworms. Wireworms can be controlled by soil treatments prior to the time of planting. Ask your farm advisor or leader how to check for the presence of wireworms and how to treat for them.

Potato production in the United States approximates 350 million bushels per year, or 105 pounds per person. We are now processing 25 per cent to 30 per cent of the crop in the form of chips, French fries (frozen), dehydrated mash, slice, flour, etc.

Although California usually is third in acreage or production, it frequently is first in farm value of the crop.

YOUR 4-H Potato Project

by
Phil A. Minges and Douglas Aulenbacher

In this project you will make plans, grow, and market some Irish potatoes. You will start with a small planting the first year. And you will expand your project in the following years.

Potatoes are considered a cool season crop, yet they have to be grown during the part of the year when frost will not injure the crop. You will need to consult your leaders or farm advisor for information on varieties, planting dates, and for other items that may be specific for your county.

In this project you will learn about growing and marketing potatoes. You will also learn about fertilizing, irrigating, and other practices that will be useful to you in growing other crops, too.

POTATO PROJECT REQUIREMENTS

Certain minimum requirements are expected of all 4-H Club members. These are given below. Look ahead and be sure of your project requirements before you start.

JUNIOR 4-H

FIRST YEAR — If you are 10 or 11 years old, and this is your first 4-H Club project in crops, you should grow at least a 50-foot row of potatoes.

SECOND YEAR — If you are 11 or 12 and this is your second project, you will be expected to grow two varieties of potatoes with at least 50 feet of row of each variety.

THIRD YEAR — The minimum requirement for the third year project is 200 feet of row with two or more varities and also two planting dates.

After you have had two or three years experience in the potato project and have become a Hi 4-H member, you will expand your project into a commercial acreage of potatoes or take up some other crop project. You will enlarge your project each year (as in the Junior Program). You will find details and requirements for the Hi 4-H Potato Project in the back of this leaflet.

Now that you know what is expected of you in your 4-H potato project, you are ready to begin work. On the following pages you will find information on the land, tools, and materials you will need; some of the practices you will follow in raising and marketing your potatoes; and information on other activities your group can do in relation to your potato project. So that you can be more "expert" in telling your family and friends about your project, you will find some interesting facts about potatoes listed in this leaflet.

WHAT YOU WILL NEED

Amount and Location of Land

You will need about 150 square feet of land for the minimum first year project. Four rows, 12½ feet long, will give you 50 feet of row. The usual row spacing for potatoes is from 32 to 36 inches apart. On this basis, a piece of ground 12 x 12½ feet will be enough, but you may want to allow an extra foot on each side for borders.

The location of this project is very important.

1. It should be near your home so that you can easily care for it.
2. Water should be available whenever needed.
3. The plot of ground should receive full sunlight during the day.
4. Avoid locations that will be shaded by large trees or buildings.

Sandy loam soils are preferred. You may grow potatoes on heavier soils, but the soil is harder to work and your potatoes may have a poor tuber shape.

Seed and Varieties

Potato seed is not a true seed such as is used to plant most other crops. It is actually a small piece of the potato itself. It takes good seed to produce good crops and potatoes are no exception. Always use "certified" seed if you can. Your leader may arrange for you to order your seed through him or through a local store. You will need 5 pounds for each 50 feet of row.

Be sure you order the proper variety. White Rose, Russet Burbank, or Netted Gem and Pontiac are the most common varieties grown in California. Kennebec is a new variety.

Ask your leader which variety you are to grow in your first year project and write it here: _____

Indicate the varieties you will use for your second and third year projects here: _____

2nd _____ and _____

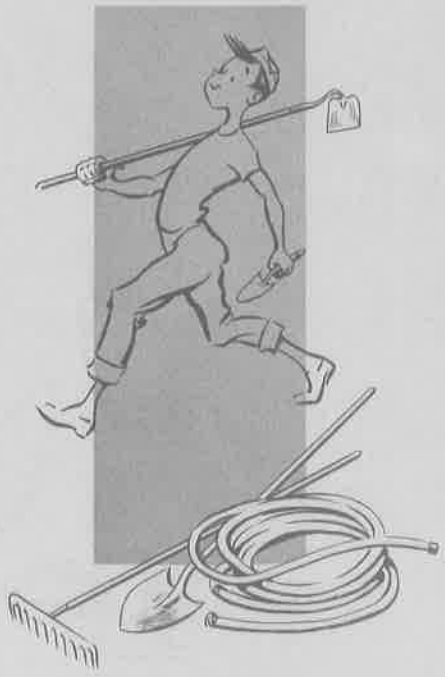
3rd _____, _____ and _____

Fertilizer

In most parts of California, 16-20-0 ammonium phosphate (16% nitrogen, 20% phosphoric acid, and no potash) is a good fertilizer for potatoes. Use three pounds for each 50 feet of row.

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

Write here the type of fertilizer _____ and how many pounds you will need for your project _____ How many pounds you will need for your second and third year projects? _____ and _____.



Equipment

You will need the following equipment for your project in the Junior 4-H program:

Shovel, hoe, garden hose for irrigation, and a spading fork for harvesting. As your project enlarges you may wish to get a small hand wheel cultivator.

Other Materials

You will need a fungicide for treating seed potatoes. Ask your leader for this material. In areas where tubermoth is a problem, you may need DDT for dusting the potatoes.

WHAT YOU WILL DO

PLANNING YOUR PROJECT

After you sign up as a 4-H potato grower, you should make plans. You should know where you will grow your potatoes and when you will do certain operations. Indicate below the dates you expect to:

- ☐ 1. Order your seed and fertilizer _____
- ☐ 2. Prepare your ground _____
- ☐ 3. Plant and fertilize _____
- ☐ 4. Start irrigating _____
- ☐ 5. Harvest your crop _____
- ☐ 6. Market your crop _____

Put a check in the box to the left when you actually do what you planned. This will show the part is completed or begun.

Soil Preparation

The ground for your project should be spaded to a depth of 5 or 6 inches. At the same time, you should turn under all old crop residue or trash. If possible, do this several weeks ahead of planting to allow the organic matter time to start decaying.

Keep the weeds under control until you are ready to plant.

Seed Preparation

This consists of treating the seed to control certain diseases and cutting the seed into proper seed-piece sizes. Both of these should be done just before you are ready to plant.

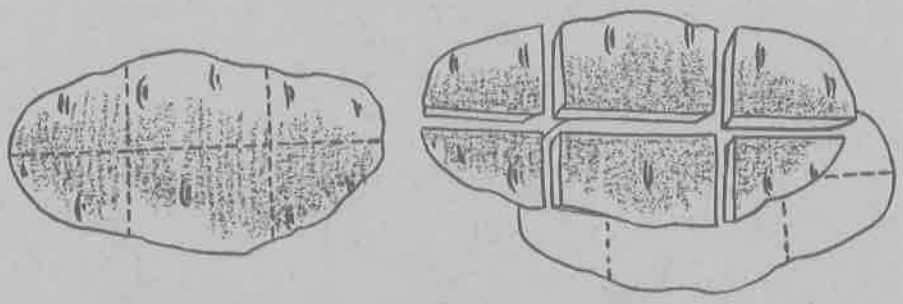
SEED TREATMENT. The purpose of seed treatment is to control any spores of such skin diseases as scab or rhizoctonia which might be carried on the seed. Mercuric chloride is a common disinfectant for potatoes.

You can secure from your 4-H leader a small packet which will contain enough mercuric chloride to make one gallon of solution when dissolved in water. The uncut seed potatoes should be soaked in this solution from 1½ to 2 hours, then removed for draining or drying.

Before you use the mercuric chloride, read the next page carefully.

Mercuric chloride will damage metal containers so the treating should be done in wooden or pottery containers. MERCURIC CHLORIDE IS VERY POISONOUS. BE CAREFUL NOT TO GET IT INTO YOUR MOUTH OR EYES. DO NOT PERMIT ANY OF YOUR SEED POTATOES TO BE EATEN AFTER THEY HAVE BEEN TREATED. It will kill animals, too, so do not let the mercuric chloride or the treated potatoes stand in a place where your pets OR CHILDREN can reach them.

BE SURE YOUR LEADER OR YOUR PARENTS HELP YOU WITH THIS PART OF THE PROJECT SO THAT YOU CAN DO IT RIGHT.



CUTTING THE SEED. A potato seed piece should have at least one eye, which is the bud from which the new shoot will grow. It should weigh between 1 and 2 ounces.

Very small potatoes may be used whole. Medium to small potatoes may be divided into 2 or 3 seed pieces. Large potatoes may be cut into 6 or more seed pieces. Medium-sized seed potatoes usually are the most economical and will plant the most area per pound.

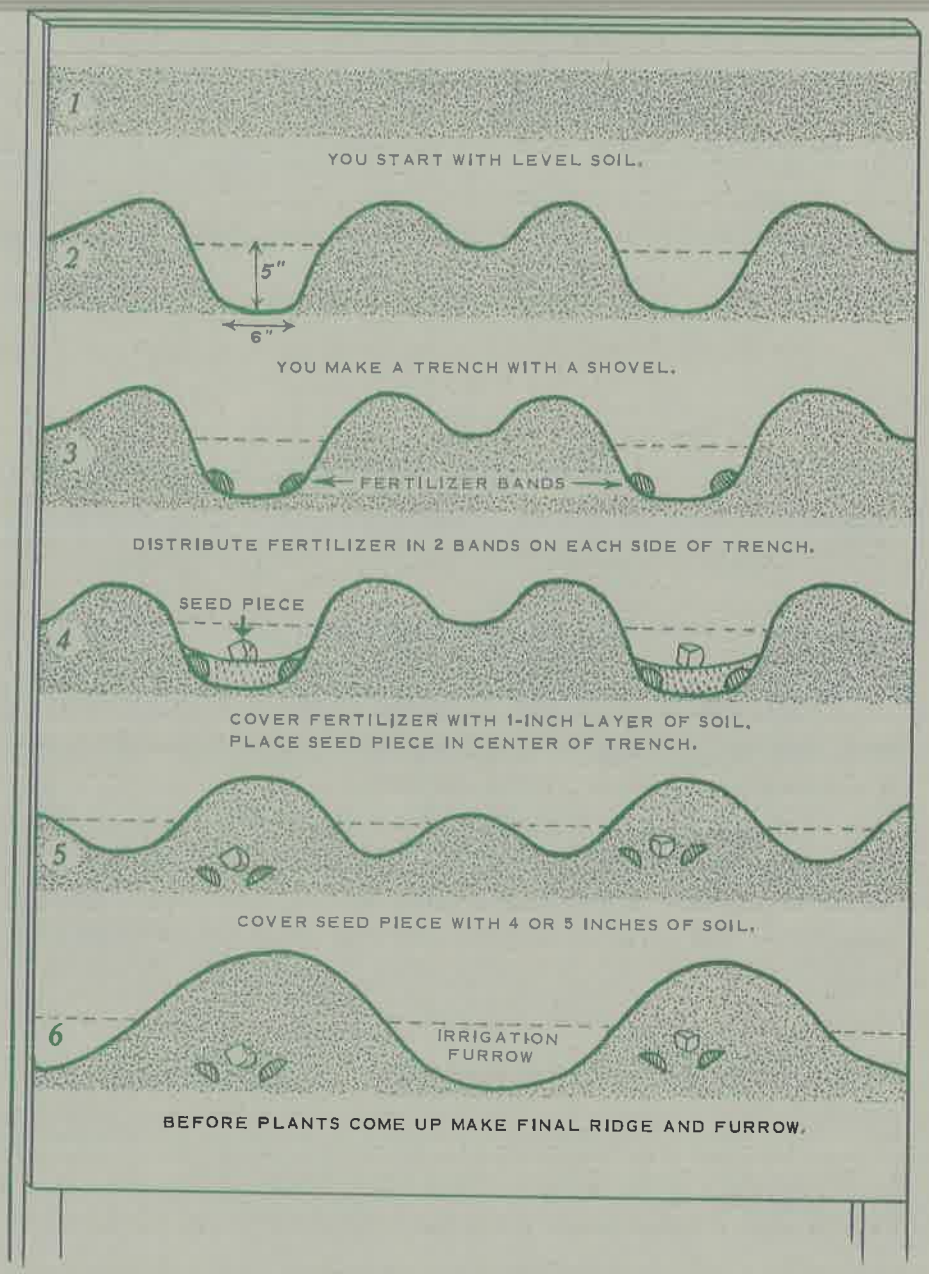
Planting and Fertilizing

The ground should be moist at the time of planting. If winter rains have not been adequate, then you may have to moisten the soil by sprinkling or furrow irrigation a few days before planting.

The first job in planting is to make a U-shaped trench, 4 to 5 inches deep, with your shovel. Next, place a band of fertilizer on each side of the trench as is shown in the picture. For 16-20-0 you would use 1½ pounds of fertilizer for each band per 50 feet of row. You can use a tin can to dribble out the fertilizer. Now you should cover the fertilizer with a one-inch layer of soil. This is to protect the seed piece from the fertilizer.

When you have done this you should place your seed pieces in the center of the trench. Space them about 10 inches apart. Cover the seed pieces with 4 to 5 inches of soil. If you have more than one row, you should space these about 36 inches apart.

PLANTING AND FERTILIZING POTATOES

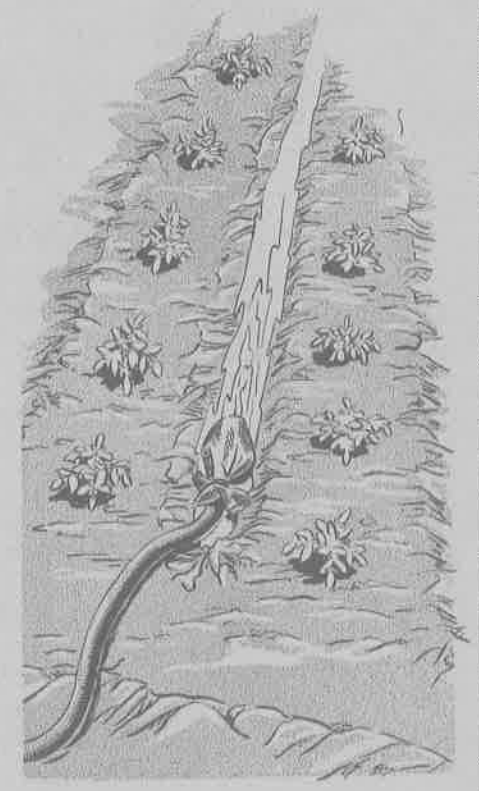


Cultivation and Ridging

Your potato patch should be kept free of weeds. It is best to do this when the weeds are very small. Weeding may be done with a small hand cultivator or by hoeing.

The final ridging should be made just before the plants emerge. The additional soil should be added to provide at least 6 to 8 inches of soil over the seed piece. The ridge should be wide enough so that the potatoes will be covered later on to prevent greening. The furrow made in this final ridging will serve for irrigation furrows.

Irrigation



Proper irrigation is one of the very important practices in producing good potatoes. The furrow or furrow-basin methods are usually preferred for potatoes. You can use a sprinkler system, however, if necessary.

Keep the soil in the rooting area moist at all times. If the soil is moist at planting time, it probably will not be necessary to irrigate until most of the plants are up. A good soaking soon after the plants emerge will usually be sufficient for two or more weeks. As the plants get larger and the weather warmer, the frequency of irrigation will need to be increased.

Potatoes require from 24 to 40 inches of water. This means you will have to irrigate oftener if you live in the warm interior valleys than you will if you live in the cooler coastal districts or mountain areas.

Find out from your leader the usual practice for irrigating potatoes in your district during the main part of the growing season. Indicate here how frequently you plan to irrigate after the plants have become established. _____

_____

Stop irrigating 2 to 3 weeks before harvest in order to let the soil dry out before digging.

Harvesting

Usually the potato vines will begin to turn yellow and die when the crop is mature. At this time, most of the tubers have reached a good size and have a well-developed "skin" called the peridern. Such potatoes will be resistant to skinning. In most areas, the potatoes mature in 110 to 140 days after planting.

For small plots, the potatoes can be harvested by hand. A regular spading fork will be best but a shovel could be used. Dig the potatoes carefully. Try to avoid cutting or otherwise injuring the tubers by keeping the digging tool to the side of the hill and inserting it deeply. When the weather is very hot, potatoes should be picked up soon after they are dug and quickly removed to a shady place. In cooler weather, it is all right to allow the potatoes to dry off for a while before picking them up. Be sure to record in your record book the weight of all potatoes harvested.

Indicate here the date or dates that you dug your potatoes:

_____

How many days from planting to harvest? _____

Did your second and third year projects take the same number of days from planting to harvest? _____

Grading and Marketing

Before you sell your potatoes, grade them carefully. You should grade them according to U.S. No. 1 regulations. Edible potatoes that do not meet the No. 1 grade can be included in a second or No. 2 grade. Cull or discard inedible potatoes.

Potatoes that meet U.S. No. 1 grade are 1-7/8 inches in diameter or larger. They are relatively free of rots, disease, insect damage and harvest injury. In addition, they are fairly uniform in shape. Poorly shaped potatoes such as knobby potatoes would be suitable for the second grade. Badly diseased or injured potatoes or those showing a considerable amount of greening should be discarded as culls.

Be sure to record the weights of No. 1 grade _____ pounds No. 2 _____ pounds, Cull potatoes _____ pounds

Your neighbors or local grocery stores will probably be very glad to buy any potatoes you have in addition to the amount you can sell to your family. You will find that it always pays to sell top quality potatoes in an attractive container.

Storage

If you want to hold your potatoes a while before you use or sell them, the best storage temperature is between 40 and 50 degrees F. The humidity should be fairly high and the potatoes should be protected against light. At higher temperatures, potatoes sprout quickly. At temperatures below 40 degrees, they become sweet. At low humidity the tubers lose moisture and shrivel.

When you are holding potatoes for a special purpose such as for a future exhibit date, it may be desirable to wrap each potato in a piece of newspaper. This will help protect them against loss of moisture, temperature changes, and mechanical injuries.

Note to Leader

A copy of the U.S. Potato Grades may be obtained from the Bureau of Shipping Point Inspection, State Department of Agriculture, Sacramento.

RELATED ACTIVITIES

When you have a potato project you can learn things by participating in related activities. They include exhibiting at 4-H and other fairs, judging plates, or classes set up by your leader, developing and giving demonstrations to teach others the things you have learned, identification of different varieties of potatoes or identification of weeds, insects, or diseases that affect potatoes and other crops, and participation in grading contests set up by your leader.

If you are interested in exhibiting your potatoes at a fair, you should select the very best specimens at the time of harvest. To prepare for exhibiting a plate of five specimens, you should select from 15 to 20 uniform, medium-sized potatoes in excellent condition. Wrap each one separately and store under good conditions until the time for the fair. At exhibit time select the five very best uniform potatoes. You can find futher ideas on exhibiting in the leaflet HOW TO PREPARE VEGETABLES FOR 4-H EXHIBITS

When is your 4-H fair or exhibit day? _____

Can you have an exhibit for it? _____

What are the dates for your county fair? _____

Can you exhibit there? _____

FOR OLDER MEMBERS

HI-4-H

When you become a Hi-4-H member and have had 2 or 3 years experience in the potato project, you are expected to expand into a commercial acreage of potatoes or take up another crop growing project, such as those listed below. As in the Junior 4-H Program, you should enlarge your crop project each year. In case you want to go into crop projects after you have entered Hi 4-H you may wish to start with the third year Junior 4-H project.

1. A minimum potato project for Hi 4-H would be about 1/8 acre in size. You should double the size each year it is continued. The common potato machinery should be used in your project.
2. You may wish to have a home garden project starting with five or six crops the first year you are in Hi 4-H and increasing the number with future projects.
3. You may wish to grow a market garden type project in which you will grow two or more vegetables for sale. Flowers might be grown in this type of project also.

4. You may prefer to grow a single vegetable crop other than potatoes on a commercial sized scale. The crop might be sold for fresh use or contracted to a processor for freezing or canning. Or instead of a vegetable, you could select a field crop, fruit or a flower crop.
5. You might like a specialized type project such as growing nursery stock, conducting a test plot type of project, or growing a crop for seed.

INTERESTING FACTS ABOUT POTATOES

Irish potatoes belong to the same family as tomatoes, peppers and eggplant. The eggplant is the most closely related to potatoes.

The edible portion of this crop is actually a modified stem called a tuber. The tubers grow on stolons (a kind of stem) which arise from the underground stem between the seed piece and the soil surface. Most of the eyes occur on the apical end which is the farthest from the plant. The end nearest the plant is called the stem-end and it has relatively few eyes.

There are over 300 named varieties of potatoes. About 62 are grown in the United States. Eight varieties account for most of the production. Five of these were discovered before 1900. Three are newer varieties developed since 1900. Katahdin and Irish Cobbler are the two most important varieties in the United States.

Potato tubers turn green when exposed to the light. The green area is mildly poisonous and severe greening makes culls of the potatoes. Potatoes should be protected from the light before harvest by keeping them well covered with soil. After harvest they should be protected from the light if they are to be stored very long.

Potato scab, ring rot and several mosaic diseases are the common potato diseases in California. The best protection against diseases is to use certified seed obtained from a reliable source.

Common insects in California are the tuber moth and wireworms. Wireworms can be controlled by soil treatments prior to the time of planting. Ask your farm advisor or leader how to check for the presence of wireworms and, if you have some, how to treat for them.

Potato production in the United States approximates 350 million bushels per year, or 105 pounds per person. About 75 percent or 260 million bushels are used fresh; 10 percent is used for potato chips; about 10 percent is used for seed purposes; around 5 percent is fed to livestock; and about 1 percent is exported to other countries.

Rerun 2/60--2500

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