

# Irrigation

## during a rainfall-deficient year

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MANY FARMERS ARE CONCERNED about the moisture needs of their crops.

Lack of water cannot be overcome by any practice other than irrigating. There are, however, some things which may be done to use water economically and which may aid in reducing its loss.

Farmers who contemplate raising annual crops this year, of course, will consider the adequacy of the supply of water in their area which will be available and may wish to defer planting this season if it seems likely there will not be enough water to mature the crops.

Growers who have permanently rooted crops such as orchards, vineyards, alfalfa, and others, and have a limited supply of water, should plan a schedule of irrigating which best serves the needs of the plants without seriously injuring them.

### Eliminate Weeds

The elimination of all weeds will conserve water since plant transpiration is the chief cause of the soil drying.

The loss of water by evaporation directly from the soil is largely confined to a shallow surface layer and very little loss occurs below the top foot.

Once the weeds have been removed, nothing will be gained by subsequent cultivation because stirring the soil for the purpose of maintaining a mulch will not affect the loss of moisture from the surface of the soil.

### Soil a Reservoir

It will help to understand irrigation requirements if the soil is considered as a reservoir which contains varying amounts of water at different times during the year.

Generally, at the beginning of the growing season, the soil will hold all the water it can, except in localities where the winter rain is insufficient or where cover crops have used some of the water.

Usually, the soil is wet to a considerable depth at this time, due to the rain or because of irrigation during the previous fall.

This year the scanty rainfall has wet the soil only to a shallow depth, and in many sections the soil is dry below the first foot. This is not enough wet soil to



Early-season irrigation of deciduous fruit orchards may be needed this year.

maintain the permanently rooted crops for very long, and water should be applied before growth starts.

### Timing Irrigation

If soils are wet to a depth of about six feet, there should be enough water stored in them, especially in sandy loam, clay loams and clays, to take care of the needs of trees and vines until the latter part of June, and economy in the use of water may be made by delaying application until that time.

Every time water is applied, there is unavoidable waste by evaporation, in conveyance to the place of use, and frequently by deep seepage.

It is best to delay irrigation until the soil-reservoir is nearly dry before irrigating.

The appearance of the soil when at the permanent wilting percentage is sometimes misleading. Frequently, soils may be moist enough to retain their shape when pressed into a ball by the hands—the method frequently used to judge the wetness of the soil—but actually the soil may be at the permanent wilting percentage, and consequently too dry for plant growth.

Another method of anticipating the time the first irrigation is needed is by watching some of the broad-leaved weeds which may be left as indicator plants in various places in the orchard. These weeds generally are deep rooted enough to indicate by the wilting—usually a decided drooping of the leaves—a depletion of the readily available moisture in the parts of the soil occupied by the roots of the weeds.

Since the weeds ordinarily are not so deep rooted as the trees, they give warn-

ing when the soil moisture in the upper layers is exhausted. The grower then has advance notice that the entire soil-reservoir soon may be dry.

When only a small stream of water is available, the time necessary to cover the orchard may be so long that trees which are irrigated last may be decidedly affected unless irrigation is started before it is really necessary.

### Deciduous Fruit Trees

A guide as to the probable need for water for deciduous fruit trees may be taken from the following tabulation in which the water loss from the soil through evaporation and transpiration has been measured at Davis from orchards in which readily available water was maintained throughout the growing season.

A portion of the water used, of course, comes from rain which is stored in the soil and the amount of irrigation needed is the difference between the total used and stored rainfall.

#### DECIDUOUS FRUIT TREES

Month	Amount of water used, inches	Month	Amount of water used, inches
March . . . . .	0.5	July . . . . .	7.7
April . . . . .	2.5	August . . . . .	5.4
May . . . . .	4.0	September . . . . .	3.4
June . . . . .	7.2	October . . . . .	1.8
Total = 32.5 inches			

Where the water supply is insufficient to maintain readily available water throughout the season, the grower must decide which is the best time to apply it.

### Water Needed in Early Season

In many deciduous fruit and vineyard sections on deep soil, if the soil is wet to

Continued on page 16

## IRRIGATION

Continued from page 3

a depth of about six feet, the trees and vines probably will come through the season without serious damage, but the current season crop may be reduced.

We suggest that the first irrigation be applied now if the rainfall has not been enough to wet the soil to a depth of about six feet.

If water for only one additional irrigation is available, a second watering, for fruit trees, should be given about the latter part of June.

Our experiments show that it is best to keep the trees and vines supplied with water early in the season. Lack of water is more injurious in early season than in the fall, although a continuous supply of readily available water at all times is most desirable.

### Economizing

Economy in the use of water by annual crops may also be obtained by applying the principle that satisfactory returns can be obtained by delaying irrigation until the soil moisture is reduced close to the permanent wilting percentage.

For example, in the Sacramento Valley it is possible to raise as large a crop of sugar beets with three irrigations of eight acre-inches each as with more frequent applications, provided the soil is wet to a depth of about six feet by rains.

Cotton usually is irrigated very frequently, but good crops may be obtained with one or two irrigations in addition to the preplanting irrigation.

Watermelons on deep loam or clay soils may not need irrigation if the soil is wet deeply before planting, but cantaloupes which are not so deep rooted as watermelons, probably will need irrigation during the growing season.

Tomatoes, a deep rooted crop, likewise may be raised with one or two irrigations on deep fine textured soil.

### Suggested Practices

The suggestions made may be summarized briefly as follows:

Do not plant annual crops unless an assured supply of water is available.

Remove all weeds, but do not waste time and effort cultivating in their absence.

Put water on in one application to wet to the full depth of rooting rather than giving frequent applications with shallower wetting, thus reducing waste.

Delay irrigation until the soil moisture is reduced to about the permanent wilting percentage, taking into consideration the size of the stream available and the acreage to be irrigated.

With a limited supply of water, irrigate in the first part of the season to keep the

crops supplied with readily available moisture, because lack of water is more injurious in early summer than late in the fall.

Find out how much water in depth of application is required and how frequently it should be applied for each crop. Material savings may be made by reducing the frequency of irrigations.

Farm advisers have bulletins and detailed information concerning the depth of rooting and irrigation of various crops.

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## QUICK DECLINE

Continued from page 12

all probability, be found to be carriers of the quick decline virus.

Progress has been slow because symptoms do not appear on one- to two-year-old trees until 15 months or longer after inoculation. Smaller trees are now being used in certain experiments. A sweet orange top is grafted onto sour orange seedlings having trunk diameters of from one-eighth to one-quarter inch.

Such trees can be prepared in a relatively short time and it is hoped that after being inoculated they will show symptoms quicker than the larger trees.

### Seek Virus Carriers

In the late summer of 1946, graft-transmission experiments, started in June of 1945, showed conclusively that quick decline is a virus disease.

A study, commenced two years before it was known that quick decline was a virus disease, discovered that more than 225 different species of sucking insects were present in affected areas. Perhaps not more than one species will be found to be capable of transmitting the virus. Extensive experimental studies are thus necessary to determine the role of insects in the spread of quick decline.

In order to establish ideal conditions for experiments involving insect carriers of virus, the Riverside Experiment Station erected a "screen house" at one of the experimental plots within the quick decline area. The screen is small enough to filter out practically all insects that could cause infection. Controlled inoculation tests are now being conducted by entomologists of the Citrus Experiment Station.

### Similar Disease in South America

Experiments in Brazil have indicated an aphid to be the virus carrier of the

disease, Tristeza, which is similar to the California orange tree quick decline.

An aphid closely related to the Brazilian carrier is present in California and efforts are being made to determine if this insect may be causing spread of the quick decline virus.

Other insects, particularly several other aphids and leaf-hopper species, are also being tested as carriers.

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## PUNJAB FLAX

Continued from page 10

### Harvesting

To windrow the flax and later thresh with combine equipped with pick-up attachment, or to combine the standing grain direct, is a question on which there is divided opinion among growers and threshermen alike. Naturally, there are both advantages and disadvantages to each method. Both methods are extensively used. In many cases, circumstances force the decision, for if the flax contains any appreciable amount of green weeds it cannot be threshed standing.

Only clean fields of mature dry flax, or ones in which the weeds and flax are both dry, can be direct combined. If conditions are favorable to direct combining, the cost of windrowing is avoided. On the other hand, dry standing flax is susceptible to loss by wind damage which in many cases more than offsets the cost of windrowing.

If windrowed, the flax should be cut as soon as the seeds are botanically ripe. This occurs several weeks before the plants are dry enough to permit direct combining. At this stage, no loss of seed from shattered bolls will have occurred. Windrowing also permits harvesting early enough to destroy most summer-growing weeds before they mature their seeds to infest the soil. Other advantages of windrowing are the more favorable weather conditions—less humidity—for threshing early in the season, and earlier use of the land for the summer rotation crop.

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Improvement in the technology of preservation of fruit juices by freezing, particularly control of the enzymes responsible for the curdling of frozen juice, is under study by the Division of Food Technology.