California AGRICULTURE

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## Storage, Shipping And Precooling Of Stone Fruits

**F. W. Allen**

The ability to hold stone fruits for even a week or ten days makes it possible for the canner or processor at the peak of the harvest season to receive fruit faster than it can be processed.

Most stone fruits will, even under best storage conditions, soon show some deterioration, with the amount and rapidity depending largely on the condition of the fruit when received.

**Storage Temperature**

The storage temperature and humidity generally recommended for peaches, apricots, plums and cherries is 31° to 32°F, with a humidity of 80-85%.

After a number of weeks in experimental storage at 32° the flesh of well matured peaches frequently becomes red, but at 31° or 30° it either remained normal or else reddening was materially retarded.

It has been reported that where freezing did not occur, peaches stored at 30° and ripened at 70° were often of distinctly better quality than those stored at 32°.

With all stone fruits, unless it be cherries, storage temperatures between 35° and 42° for any length of time have proven unsuitable.

One of the first signs of deterioration in peaches, nectarines and apricots is loss of flavor—followed perhaps by a discoloration of the flesh. This loss of flavor may be noticeable even after a period of ten days.

**Peaches**

In some of our experimental lots of peaches, fair quality still existed after a storage period of four weeks at 31° but browning of the flesh occurred very soon after the fruit became ripe. After holding for six weeks in storage all samples, even though of good external appearance, were worthless.

**Apricots**

Well matured apricots in a few instances have been held with fine appearance for eight weeks. Observations however, on approximately 200 samples showed that the flavor had generally deteriorated and that 12% developed some browning around the pit during four weeks in storage. Little difference was noted in this respect between samples held at 30°

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# Comparative Tests On Plowed And Unplowed Soil For Sugar Beet Seed-bed Preparation

**L. D. Doneen**

Results of trials over a period of four years show that nothing is gained in the production of sugar beets by plowing the soil in seed-bed preparation provided shallow cultivation kills all the weed growth.

In this study, plowed and unplowed plots proved to be substantially the same in yield, sugar content, purity, and number of beets per acre; the volume weight and pore space of the soil; penetration rates of the irrigation water; and the shape of the beets.

If weeds infest the surface soil, plowing may be practical for burying their seed deeply and thus eliminating some of the weed growth the next year.

Under certain other conditions, such as where a plow pan exists, deep tillage or plowing may be necessary. Plow pans interfere with the penetration of irrigation water and sometimes cause rotting of the beet root. They should be broken by deep tillage or deeper plowing.

Even though these exceptions exist, plowing could be eliminated profitably on much of the sugar beet land in California.

**Preparation of the Seed-Bed**

The experiments consisted of two treatments; (1) The soil was not plowed, but was stirred to the depth of two to four inches with a springtooth harrow or disk to kill all growing weeds before the crop was planted. (2) The soil was plowed 12 inches deep in the late fall or winter.

The sugar beets were planted the latter part of January or in February, according to weather conditions. Except for keeping cultivations to a minimum for weed control, the cultural operations after planting were the same as those practiced in the area adjoining the experimental plots.

**Yield of Beets and Sugar**

The difference in mean yield for the treatments, 0.44 tons of sugar beets, was not statistically significant.

The difference in per cent sugar was slight between the plowed and unplowed plots. The average for the two treatments showed 0.33% higher sugar in the beets for the unplowed than for the plowed plots.

The purity of the beets was about the same for both treatments. The average gross sugar per acre was essentially the same.

**Drying and Crusting**

When there were conditions favorable for rapid drying of the soil, it was observed throughout these experiments that the surface soil dried earlier in the plowed plots. In the areas not plowed it showed higher moisture for several days.

In areas where crusting of the soil is a problem, the moist surface of the shallow-tilled soil provided a period several days longer for the emergence of the seeding before crusting occurred. On the unplowed soil, the crusting was usually less severe than on the finely pulverized plowed soils.

**Germination of the Seed**

In the unplowed areas, the seed ball was placed on a firm and compact soil, which may have given better germination. The time for seedling emergence on the unplowed land was two to four days less than on the plowed.

Even though the plowed land had been harrowed and rolled, there was a tendency to deeper planting because the soil was so loose.

**Growth of Roots Above the Surface**

A study was made to determine whether a firm soil, as in the unplowed plots, would cause more of the beet root to grow above ground than in plots plowed 12 inches deep.

The results indicated that the fleshy part of the beet root was not forced to grow above the unstirred portion of the soil.

**Specific Gravity of the Soil**

Investigations were made of apparent specific gravities of the soil of these two treatments.

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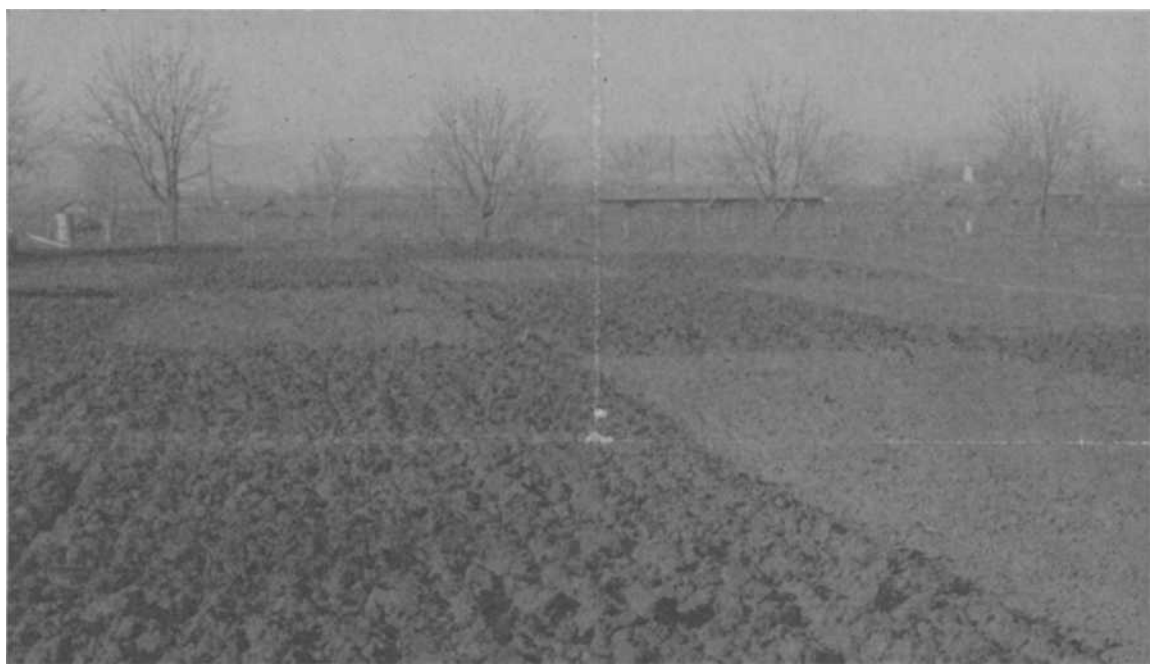

Partial view of the plowed and unplowed plots in the seed-bed preparation experiment. The rough land indicates the plowed plots, later cultivated to finely pulverized seed-bed. The light areas indicate the unplowed plots, which have been disked about two inches deep, floated, and made ready for seeding the crop.

## Fertilized Legumes Aid Following Crop Of Non-legumes

**John P. Conrad**

Fertilizers containing no nitrogen may increase the growth of legumes such as bur clover, vetch, and peas, which contain relatively high amounts of nitrogen. This is possible because bacteria contained in nodules on the roots of legumes fix the free nitrogen of the air—a form unavailable to most other plants.

The increased amounts of fixed nitrogen supplied by the decay of the residues of these fertilized legumes may give greater yield to the following crops of non-legumes.

Until recently the possible magnitudes of the increases in yields of legumes and of the following season's non-legumes for many agricultural conditions in California had not been recognized. Nor had the particular fertilizer or combination of fertilizers nor the legumes best suited to give increased growth of the following non-legumes for each locality been determined.

Observations in one area of Ventura County a few years ago indicated that carriers of sulfur markedly increased the growth of bur clover, and that this increased legume growth more than doubled the yields of the following barely crop, gave some idea of the magnitudes of the increases possible.

**Field Trials**

As sulfur alone could not be expected to give maximum yields of legumes in every location throughout the state, about 150 exploratory trials to determine local deficiencies by the response obtained, were established in 20 representative counties.

In general at each location, treble superphosphate supplying phosphorus, muriate of potash— potassium chloride—supplying potassium and gypsum supplying sulfur were applied singly and in all combinations.

About 50 good—50%—to marked —200% to 1000%—increases in the growth of legumes, principally bur clover and vetch, on range, hay, grain, and pasture lands have already been secured. Of these increases about 40% have been from gypsum alone, about 40% from treble superphosphate alone, and about 20% from a combination of the two. The possibilities of additional responses from potash seem promising in some areas but further detailed

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## Costs Of Methods Of Mechanized Harvesting Of Alfalfa Hay Are Subjects Of Comparative Study

**Arthur Shultis**

To compare methods and costs of harvesting alfalfa hay in California a survey was conducted by the Bureau of Agriculture Economics in 1945.

In California, over 100 records were collected on alfalfa hay harvesting in Madera County, where most methods used in the Central Valley were available for study.

**Mowing and Raking**

There were 30 horse-drawn and 79 tractor mowers in the study.

The total cost per acre for mowing with a 5-foot horse-drawn mower, averaged $1.39.

The average total cost of tractor-drawn 6-foot mowers was 72c per acre.

Where 7-foot tractor-drawn mowers were used, the total average cost per acre was 71c.

In cases of horse-drawn dump-rakes the total cost per acre averaged 71c also.

The cost of the 10-foot tractor-drawn side-delivery rake, averaged 70c per acre.

**Loose Hay**

Transportation of loose hay from windrow to storage was studied in cases of pitching on and off, pitching on and unloading mechanically, and the use of a hay loader in the field with mechanical unloading at storage.

In cases where horse-drawn wagons were used with the pitch on and off, the output averaged 0.7 tons per hour at a total cost of $4.44 per ton. Where the wagons were tractor-drawn the output was 0.9 tons per hour at a total cost of $4.35.

(Continued on page 2)

## Control Of Vapors In Storage Essential For Prolonging Life Of Avocados And Citrus Fruits

**J. B. Biale**

Improved keeping quality and longer storage life were the aims of extensive studies conducted during the past seven years on storage problems of avocado and citrus fruits.

It was found that respiration measurements afforded an objective criterion for determining the effects of various treatments. These measurements consisted of finding out by suitable chemical methods the amount of oxygen absorbed and carbon dioxide given off by the fruit.

**Respiration and Ripening**

The relationship between respiration and ripening is most striking in the case of the avocado.

When a sample of fruit is placed at a constant temperature and under a constant rate of ventilation, the rate of carbon dioxide evolution first drops to a minimum, then increases sharply to a maximum, followed by a marked decrease in respiratory activity.

Fruit softening was found to be closely associated with this trend in respiration. It never occurred prior to the peak but always following it. From the nature of the carbon dioxide curve, predictions could be made as to the date when avocados would be most suitable for consumption.

To prolong storage life, different treatments were employed which would delay the rise in respiratory activity. Reductions in the oxygen content of the atmosphere and increase in carbon dioxide concentration resulted in doubling and tripling the storage life of Fuerte avocados.

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# Poultry Nutrition Research Proves Helpful To Humans

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the fact that a sufficient amount of this vitamin in the diet is required to prevent a dermatitis of a different type from that caused by a deficiency of pantothenic acid. Biotin — like choline — is necessary for proper bone growth.

**Folic Acid**

Believed to be the only vitamin discovered by industrial research, folic acid was isolated, identified and later, in 1946, first produced synthetically in a commercial laboratory. One of the scientists participating in the synthesis of folic acid was a former member of the staff of the Division of Poultry Husbandry.

The same laboratory was conducting experiments with a synthetic diet for poultry, similar to those in progress in Project 677-D-2.

A new formula for the synthetic diet, which included folic acid, was constructed by the scientists in the commercial laboratory. Day old chicks were placed on the new formula. They grew, matured and produced eggs. In turn, those eggs hatched and the resulting chicks are growing.

Experiments with folic acid conducted as part of Project 677-D-2 indicated that the requirement of the vitamin by Single Comb White Leghorn yearling hens for egg production is low. Breeding hens require higher levels of folic acid for sustained high hatchability of their eggs than for egg production. The best level for hatchability has not been determined.

Folic acid is especially remarkable for the swiftness with which it increases the red corpuscles in the blood. This ability suggested extensive investigations which were made by many research laboratories.

Successful attempts to cure cases of diarrhea in laboratory animals, notably in monkeys, indicate the need for folic acid in the intestinal tract to prevent diarrhea.

Investigations have produced the conclusion that the natural manufacture or synthesis of folic acid by the human system is impaired, if not halted, by the presence of a sulfa compound in the intestines. Treatments with synthetic folic acid have counteracted the deficiency.

The addition of folic acid to the human blood stream results in a rapid increase in the red corpuscles with the attendant expansion of the oxygen-carrying ability of the blood. Patients suffering from certain types of anemia have made quick and complete recovery following treatment with folic acid.

**Nutritional Research Continues**

In universities, experiment stations, and in commercial laboratories, nutritional research continues with the emphasis of interest being extended to the specific requirements of animals and humans for amino acids.

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*Staff members who have worked on Project 677-D-2, under the direction of L. W. Taylor, Professor of Poultry Husbandry and Poultry Husbandman in the Experiment Station and Head of the Division of Poultry Husbandry, include: S. Lepkovsky, Professor of Poultry Husbandry and Poultry Husbandman in the Experiment Station; V. S. Asmundson, Professor of Poultry Husbandry and Poultry Husbandman in the Experiment Station, Davis; H. J. Almquist, Associate Professor of Poultry Husbandry and Associate Poultry Husbandman in the Experiment Station, resigned 1942; T. H. Jukes, Assistant Professor of Poultry Husbandry and Assistant Poultry Husbandman in the Experiment Station, resigned 1942; F. H. Kratzer, Assistant Professor of Poultry Husbandry and Assistant Poultry Husbandman in the Experiment Station; C. R. Grau, Instructor in Poultry Husbandry and Junior Poultry Husbandman in the Experiment Station; F. H. Bird, Senior Laboratory Technician; and E. L. Robert Stokstad, graduate student, 1934-1937.*

*Dr. H. J. Almquist and Dr. E. L. Robert Stokstad are considered contemporary discoverers of Vitamin K with Dr. Henrik Dam, Denmark.*

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The use of phosphate in synthesis of sugars and starch by plants is under extensive biochemical study by the Division of Plant Nutrition.

# Differences In Fertilization Needs Of Citrus In Florida And In California Explained

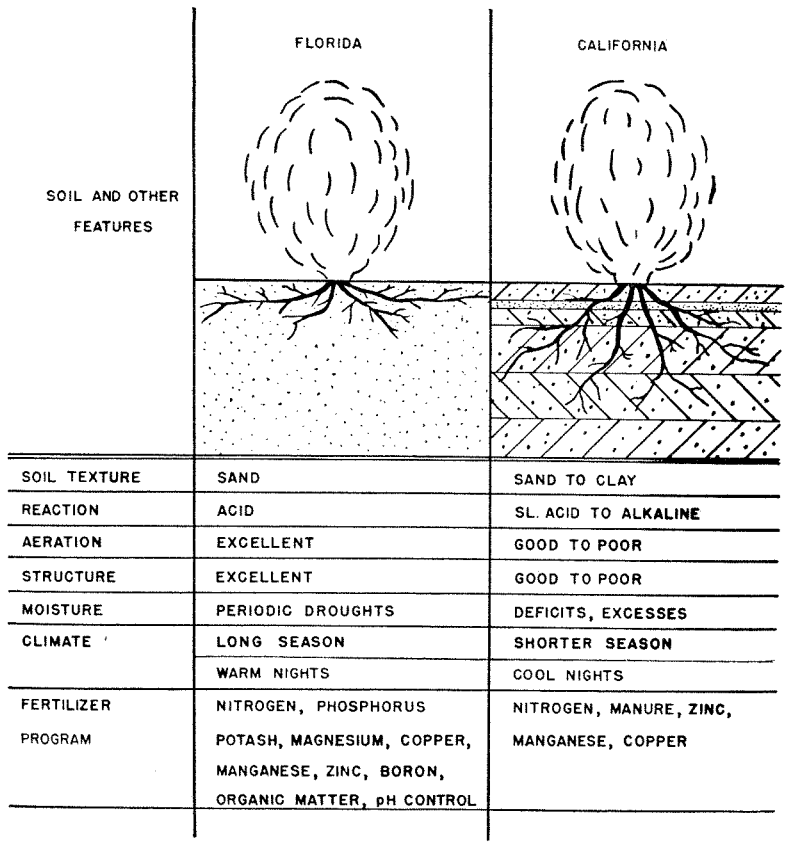
*Condensation of an article by H. D. Chapman, published in full in the June issue of* Citrus Leaves *and in the July issue of* Citrograph.

The fertilization of citrus, or of any other crop, is far from an exact science.

Often in contemplating the purchase of some fertilizer or soil conditioner, it is forgotten that present poor tree condition or low yield may be the result of circumstances in which the soil has played no part at all. Past wind or frost damage, hot spells, scale, aphis, or spider infestations, spray injury or combinations of these often prove to be the source of the trouble.

**Differences In Soils**

The root system of citrus trees growing in the sandy soils of Florida is shallow and aeration is excellent. No serious difficulty therefore is encountered in getting fertilizer salts into the root zone and soil structure deterioration is not a problem in general.



| SOIL AND OTHER FEATURES | FLORIDA | CALIFORNIA |
|---|---|---|
| SOIL TEXTURE | SAND | SAND TO CLAY |
| REACTION | ACID | SL. ACID TO ALKALINE |
| AERATION | EXCELLENT | GOOD TO POOR |
| STRUCTURE | EXCELLENT | GOOD TO POOR |
| MOISTURE | PERIODIC DROUGHTS | DEFICITS, EXCESSES |
| CLIMATE | LONG SEASON | SHORTER SEASON |
| | WARM NIGHTS | COOL NIGHTS |
| FERTILIZER PROGRAM | NITROGEN, PHOSPHORUS POTASH, MAGNESIUM, COPPER, MANGANESE, ZINC, BORON, ORGANIC MATTER, pH CONTROL | NITROGEN, MANURE, ZINC, MANGANESE, COPPER |

Comparative soil, climatic characteristics, and fertilizer program of Florida versus California.

California citrus soils are predominantly heavier in texture, They vary all the way from loamy sands to clays.

Aeration is, in general, poorer in California citrus soils than in the sandy soils of Florida.

The increased amount of clay in California soils, and other textural characteristics, make them susceptible to structural breakdown, to the development of poor tilth, to puddling, and to physical deterioration in general.

**Soil Moisture**

In Florida the average rainfall is around 50 inches annually. The general moisture situation, from the standpoint of tree growth and health, is perhaps somewhat better than under California conditions.

In California, during the summer months, moisture deficits between irrigation often occur; these tend to promote fruit dropping and in some instances may decrease the growth rate of fruit. In wet winters the root zone oftens remains in an overmoist condition for long enough periods to promote root rot or root deterioration.

**Effect of Climate**

The climate of Florida is characterized by greater humidity, warmer nights and a longer growing season than in California. These promote more rapid growth, more rapid recovery from adverse factors and perhaps better yields.

It is probably the particular complex of climatic conditions which prevail in California that makes for superior fruit quality.

**Fertilization Needs**

The sandy soils of Florida have become depleted of many of the essential plant foods by the leaching action of the rainfall.

It has been necessary to add some eight or nine elements to meet citrus tree requirements. The natural soil provides a moisture reservoir and a very favorable physical media for root development but the needed plant foods for the most part are supplied by fertilizers and nutritional sprays.

In contrast, California soils are much richer in calcium, magnesium, phosphorus, potash, and other elements. Also, they are much more variable in texture.

The Florida fertilizer program involves the use of nitrogen, phosphorus, potassium, magnesium, zinc, manganese, copper, boron, and organic matter, with control of pH.

The hydrogen ion concentration control program is to reduce the rate of leaching losses of magnesium and other bases. There may be some favorable influence on plant food availability.

Organic matter is important as it tends to decrease the rate of plant food losses by leaching.

The items used in Florida which seem unnecessary in California are phosphorus, potassium, magnesium, and boron. The results of future research may bring to light data and facts which will modify present recommendations.

**Phosphorus and Potash**

The possible need of California citrus soils for these elements has been under investigation for many years. The weight of the evidence to date is negative as to the need for additions of potash and phosphorus.

**Magnesium**

Comparative soil analyses show that California citrus soils are much better supplied with magnesium than are Flordia soils. In addition, all irrigation waters in California carry dissolved magnesium.

**Boron**

To date, no evidence of a need for boron has developed in California citrus soils. As in the case of magnesium, most irrigation waters add boron to the soil. Some waters, as is well known, supply excess boron to the point of being harmful to citrus trees.

**Iron**

In a number of areas in California iron chlorosis or deficiency is a perennial problem.

The most helpful practice which has come to light is better control of soil moisture. In many instances the use of less irrigation water or cutting down on irrigation frequency or holding off on the spring irrigation until the subsoil shows a real need for moisture, have done wonders toward clearing up iron deficiency.

**Factors Important To Soil Conditions**

Because California Citrus soils are heavier, in general, than Florida soils they are subject to structural deterioration and plow sole development. These conditions are considered to be of as much importance to the nutrition and well-being of citrus trees as is the chemical makeup of the soil.

**Cultivation**

It is now well-established that cultivation acts to break down soil structure and is the principal cause of plow sole development.

While the practice of noncultivation is still too recent to permit of proper evaluation, there are reasons to believe that plow sole may gradually disappear or become less serious under this system and soil structure improve.

**Grove Traffic**

Pest control operations, cultivation, furrowing out, picking, pruning, fertilizing, and orchard heating, together with other miscellaneous operations, amount to a considerable total of traffic in orchards.

These operations are particularly detrimental on certain soils when they are too wet. It is often not possible to time orchard operations so that moisture conditions are most favorable but every effort should be made to cut down on the amount of traffic, especially that involving trucks, tractors, and heavy machinery. It is especially important to keep off the soil while it is wet.

**Structural Breakdown**

To some extent the addition of manures or the growth of covercrops will help prevent or overcome structural deterioration. In many soils where cultivation is practiced, the frequent use of some sort of organic matter is indispensable.

**Water Penetration**

In orchards where water penetration is poor, favorable results have been obtained in many instances from the use of gypsum or organic matter.

Many soil acidifying agents such as sulfur, sulfur dioxide, sulfuric acid, lime sulfur, etc., are being offered for sale as soil conditioners. While many of these agents will, like gypsum increase water penetration—largely through reactions which form gypsum in the soil—they also exert an acidifying influence on the soil.

No clear answer is yet available as to whether soil acidification in citrus groves is beneficial. A number of field experiments are under way on a variety of soil types, but insufficient time has elapsed for clear-cut answers to emerge.

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*H. D. Chapman is Professor of Agricultural Chemistry and Chemist in the Experiment Station, Riverside.*

# Sugar Beet Seed-Bed Preparation On Unplowed Soil

(Continued from page 1)

There were no essential differences in weight per cubic foot of soil. The pore space was in an inverse relation to the weight of a cubic foot of soil. At the time when the fleshy part of the root was enlarging, the volume weight of the soil was about the same whether the land was plowed or not plowed.

**Water Infiltration**

The rate of water infiltration for the first irrigation showed a higher rate for the plowed plots. For the other two irrigations, the rate was about the same for the two seed-bed treatments.

Judging from the data, plowing will not increase the rate of water infiltration except, possibly, during the first irrigation.

**Shape of Beet Roots**

The shape of the beet roots from the two seed-bed treatments was studied for the first three years of the experiment.

From the results, it is clear that the shape of the beet is not measurably affected by whether or not the soil is plowed.

**Depth of Rooting**

Sugar beets root deeply. They extract all the readily available moisture and nitrate nitrogen in the soil to a depth of at least six feet.

Cultivation or even plowing can not be expected to influence greatly the growth and yield of beets which draw their nutrients and water requirements from six feet of soil.

**Cultivation Trials**

The effect of spring cultivation on the yield and sugar content of the sugar beet was studied.

The results indicated that cultivation is necessary only for weed control.

Weedy land with much spring rain may require three to four cultivations, whereas land relatively free from weeds may require, in the absence of rain, one or, at the most, two cultivations for control of weed growth.

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*L. D. Doneen is Associate Irrigation Agronomist in the Experiment Station, Davis.*

## ABSTRACTS OF NEW PUBLICATIONS

**TOMATOES**

CANNING TOMATOES: SITUATION IN CALIFORNIA, 1947, by Walter D. Fisher. Ext. Cir. 369, July, 1947. (16 pages).

California now produces over one third of the United States' canning tomatoes, and puts up a large percentage of the country's pack of tomato paste and sauces. The state's main producing areas are the counties surrounding the Delta and San Francisco Bay. Its 1946 crop was the largest in history.

Some, but not all, of the expanded production will continue. The overall picture depends on national consumer income, a factor which cannot be accurately predicted. Since the 1946 crop was so large, canners' demands for 1947 will be below those of the previous year. Both growers and canners should keep informed on economic trends in the nation as well as conditions in their own locality.

**ROOTSTOCKS**

APPLE, QUINCE, & PEAR ROOTSTOCKS IN CALIFORNIA.

Even favorable varieties of apple, quince, and pear differ in suitability as rootstocks. Observations and experiments with various roots and intermediate stocks have been recorded for these fruits.

Apple is the only rootstock on which apple varieties have been grown commercially in California. A well-tested, good rootstock resistant to woolly apple aphid is desirable, but no completely satisfactory one has yet been found.

Quince varieties are grown only on roots of their own species. The greatest use of rooted quince cuttings in California is for rootstocks for pear trees. The Angers type is used for this purpose.

Pear is grown in California on the so-called French pear roots, with or without blight-resistant Old Home as an intermediate stock.

Quince roots with Hardy as an intermediate stock are also used.

Insect pests and disease which attack rootstocks of each species are discussed in the following bulletin, which also covers the relation between rootstock and climate, soil, planting, irrigation, and pruning.

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As a part of a long-time dairy cattle breeding project, the Division of Animal Husbandry is outcrossing inbred lines of Holsteins to determine the extent of hybrid vigor that may be developed.

## DONATIONS FOR AGRICULTURE RESEARCH

Gifts to the University of California for research by the College of Agriculture, accepted in July, 1947

BERKELEY

California Farm Bureau Federation and Canners League of California.....$2,298.00
Research on tomato insects and disease control methods and procedures, by Division of Entomology

Merck & Company.....25 milligrams biotin
Division of Poultry Husbandry

DAVIS

California Committee on Relation of Electricity to Agriculture.....$2,500.00
Electrical applications to agriculture, Division of Agricultural Engineering

Central California Berry Growers Association.....$ 800.00
Strawberry investigations by Division of Pomology

Producers Cotton Oil Company....One Sizz-Weeder, complete with butane equipment
Division of Agricultural Engineering

LOS ANGELES

Jerry Martin.....Two packets of valuable orchid seed from Venezuela
Division of Ornamental Horticulture