

# Testing A Nontillage System Of Citrus Soil Management

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In a system of nontillage citrus management the soil is not cultivated, no cover crops are grown and weeds are killed by oil sprays or special weed killing compounds. Under this program roots develop near the soil surface and low placed branches grow normally since neither are damaged by cultivation equipment. Nontillage has come into extensive use in California groves during the past twelve years.

At present, nontillage appears to have the greatest advantages in isolated areas where weeds will not enter from adjoining cultivated areas, in small groves where custom cultivation presents difficulties, in groves where the contour of the land is such that furrow irrigation does not efficiently apply the water to the trees, and in groves where the trees are so large that equipment can not easily operate.

## Compared With Disking

In an experiment started in 1949, at the Citrus Experiment Station in the Salt River Valley, nontillage is being compared with a cultural program of disking in early March, once or twice in the summer and in October. In the nontillage plots the weeds have been killed with weed oil sprays, when they are less than six inches high.

A large sprayer has been employed to apply a mixture of weed oil and water to the weeds under about 70 pounds of pressure. Applications are made with a hand spray gun equipped with fan type nozzles. In both treatments water is flooded over the soil in a permanent modified basin type system, and equal amounts of nitrogenous fertilizers are applied.

## No Trends Apparent

Nontillage trees have produced slightly larger amounts of fruit than the trees under disk cultivation. However, this difference is not caused by the tillage program because greater variations in yields occurred between the individual trees in the plots. No trends have developed which suggest that either treatment

is superior. In both treatments the annual trunk growth has been almost identical and fruit sizes and quality have been similar.

Since fruit production and quality are equal, other factors must be considered in evaluating the nontillage program. The summary of the operations on a 2.7 acre nontillage demonstration area serves as a guide for the cost of the program.

During the first four years sprays were applied from 6 to 14 times per year. Costs were higher than they would be at present because superior weed oils are now available. However, the costs during the first two years will vary greatly depending upon the extent of infestation with Johnson and Bermuda grass.

## Weeds Keep Coming In

Weed seeds have continued to enter the area so that it appears that spraying will be required indefinitely. During the last four years three general applications of weed oils have been needed each year. These applications have been supplemented by spot spraying and hoeing.

Average annual cost of weed oils has been about \$21 per acre. About 16 man hours per acre have been required for spraying and hoeing, so the total labor and material cost has been about \$35 per acre. Depending upon conditions, the cost of disking, furrowing and cross checking for irrigation in commercial groves ranges from \$20 to \$35 per acre

each year. Thus, it appears that nontillage will be somewhat more expensive than the conventional disk program, even after the program has been in effect for many years.

## Nontillage Has Advantages

The nontillage program has certain operational advantages over disk culture. The soil in the grove is always in the best condition for heat transfer. Thus, damage from freezes is minimized and the problem of weed control and disking during the cold winter months is not encountered. If orchard heaters are used, the heaters are left in place so the cost of placement and removal is eliminated.

The grove is always ready for irrigation so delays caused by cultivation do not occur. Less water is required because there are no weeds to compete with the tree for water. Picking and pruning is facilitated because roads do not need to be prepared, the soil is firm, and the weeds do not interfere. The soil dries more quickly after an irrigation so that picking can be done sooner. The gopher problem is reduced because gophers normally do not prefer bare soil.

At the Citrus Experiment Station water enters the soil more slowly in the nontillage plots than it does in the cultivated ones. This is induced by the compaction of the surface soil which apparently is caused by the flood irrigation system. To overcome this problem, permanent basins have been constructed. After the construction of these basins more uniform water application to all trees has been obtained than normally occurs in furrow irrigated cultivated groves.

**BELOW, nontillage protects low-hanging branches and surface roots, but requires frequent spraying to control weeds.**

