

## WHY CULTIVATE AN ORCHARD?

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### **SOILS UNCULTIVATED IN NATURAL STATE**

Nature has provided no method for extensive stirring or cultivating of soils during their development. It is true that soil-forming materials are moved from place to place by water or by wind and that there is some soil stirring by organisms such as rodents, worms, and insects. Soils usually develop favorable granular structure under natural conditions when covered with sod or forests. During this development period they have been unfilled. With rare exceptions, soils have a better structure or are in a better state of tilth in their virgin state than after any period of cultivation.

### **CULTIVATION A DESTRUCTIVE PROCESS**

Experiments have been conducted in which rates of water infiltration were reduced, during only six seasons of moderate cultivation, to less than one-fourth the rates found in the virgin soil. In most instances, the longer the period of cultivation, the more rapid deterioration in structure, to the point where soil management problems multiply by leaps and bounds. Frequency is also a factor. The second cultivation after the soil has been wet may be more destructive than the first. One experiment was conducted at Riverside by Jenny and Parker in which a good soil was cultivated fifty times in one day. Some plots were wet, some dry. The soil structure in all of the tilled plots was destroyed to the extent that even the most vigorous species of weeds would not grow. The soil had to remain in a state of uncultivated fallow for eight or ten years before a reasonably good structure developed once more. Such soil changes have been taking place in California orchards to a greater or lesser degree, depending upon soil type and management systems. One result has been that impaired water penetration is now a major problem in many of our cultivated orchards.

It must be concluded that soil stirring is a destructive process which breaks down the normal good structure of the soil into one which is less favorable. It is a process which should be examined with the greatest care and conducted only to the extent that it will accomplish purposes sufficiently useful to outweigh the inevitable damage.

### **USEFUL PURPOSES OF CULTIVATION**

What, then, are the useful purposes of cultivation? For agriculture in general, the most useful purpose of soil stirring is to control weeds. Weeds compete with the growing crops for both moisture and nutrients. This competition may be very severe. Cultivation

has long been the most common method for eliminating or controlling weeds. Weed control ordinarily is the factor guiding the timing and depth of cultivation, and the tools to be used. Many of the other purposes of cultivation may be accomplished during the weed control operations.

In an arid region like ours, another important purpose is to prepare earth structures for the distribution of water. Such structures include ridges, furrows, and so forth. If water is applied by sprinkling, such structures are not needed. Where needed, it may be unnecessary to renew them for each irrigation.

A third reason for cultivation is the preparation of seed beds. Seed beds in orchards may be important in connection with the planting of cover crops. Seeds will not germinate readily if thrown on top of bare ground; the soil usually requires some preparation. Seed will be used most efficiently if planted in a soil with open structure of small granules and planted to a depth at which the soil remains moist.

A fourth reason for cultivation is to assist in the effective use of fertilizers. Some fertilizer materials are used more efficiently if drilled into or mixed with the soil. This is particularly true of phosphates used to promote the growth of either trees or cover crops. Phosphates may be "fixed" in the surface soil and may be less readily available if applied to the surface than if mixed with the soil. Gaseous ammonia is sometimes injected into orchard soils as a source of nitrogen. The soil must be loosened to a depth of several inches for this operation to be conducted.

All other purposes of cultivation may be lumped together under a fifth reason, *to facilitate other orchard operations*. Included in these purposes would be the smoothing of land for the harvesting of crops such as prunes, figs, and walnuts; the breaking down of ridges or other structures which would interfere with the traffic of spray rigs, trucks for harvest, and so on. There are a number of operations which may be facilitated by some sort of soil stirring operation. There are fewer orchard operations which would be aided by cultivation in avocado orchards than in other orchards.

### ***HOW MUCH TO TILL***

Since tillage has its harmful aspects, particularly so in the arid regions where soil granules seem to have less stability than elsewhere, tillage should be limited to the minimum amount necessary to accomplish the useful purposes. For many orchards, this might mean no tillage at all.

In one typical orchard not cultivated for many years, the soil structure is good; the orchard is productive; weeds are controlled by oil sprays; weed seeds are scarce in the locality so the method is not unduly expensive. Water is distributed in shallow, permanent furrows which do not interfere with the necessary traffic. Such a system may be more practical for citrus and avocado orchards than for deciduous, since these trees shade much of the ground sufficiently to control most of the weeds. Orchards irrigated with well water which contains no weed seeds may have less trouble than those irrigated from surface supplies. The system is practical, but the cost of controlling weeds by spraying may be excessive.

Other orchardists have chosen to operate with a permanent grass cover. Such a

method is not always successful, because the cover competes with the trees for water and for nutrients, harbors rodents and other pests, and may create a fire hazard. However, such a system usually results in great soil improvement and may be entirely practical for many situations.

### ***HOW DEEP TO TILL***

The depth of tillage should not be more than required for the useful purpose to be accomplished by the operation. Weeds may often be controlled by very shallow tilling with sweeps or knives. Broad base furrows may be made in only a few inches of loose soil. Stirring of the soil into the root zone usually impairs production, especially with surface rooting trees like avocados. The more roots cut, the greater the damage. While subsoiling may pay as a preplanting operation, it is usually only a destructive process in the orchard.

### ***TILL AT PROPER MOISTURE CONTENT***

Tillage should, if possible, be limited to the time when the soil a few inches below the surface is dry enough to crumble rather than "slick over" or pack. Soils which are too wet compact more readily than those with a favorable moisture content. If the soil is too dry, however, it may break down into a fine dust. This dust represents a single-grain structure and the soil may be damaged more from being reduced to a dust than would be the case if it were worked too wet.

### ***CHOICE OF IMPLEMENTS***

Implements should be chosen after careful appraisal of the jobs to be done. It is unwise to stir the soil to a depth of six inches if half that will suffice. It is unwise to use a heavy tractor if a light one is available and will do the task. Many orchardists use depth control rollers on their discs. These not only save the soil, but also a large percentage of the power.

### ***DEVELOPING THE TILLAGE PLAN***

A good manager always appraises the possible benefits to be accomplished by a tillage operation and if there is not sufficient justification, money will be saved and the soil will be left in better condition if the operation is omitted. Many orchardists have found useful functions of soil stirring can be accomplished by three or four operations a year. Such operations, if properly performed under favorable soil conditions, will not result in the material impairment of soil structure. It is fortunate that many people have learned the advantages of having the soil somewhat cloddy and somewhat trashy. Good-looking farming is not necessarily good farming.