

SOME SUGGESTIONS ON SOIL MANAGEMENT

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The most important functions of the soil are to serve as a reservoir for the storage of available water, and as the source of supply of plant nutrients. There are two fundamentals of soil management related to these important soil functions. They are:

1. The control of soil moisture
2. Maintenance of fertility

The tree is affected favorably or adversely according to the way soil management practices influence the moisture conditions or the supply of nutrients. The five soil management practices are irrigation, drainage, fertilization, cover cropping, and tillage. These practices are not fundamental in themselves, but are merely incidents in the production of a crop, to be utilized or not, according to conditions that arise from time to time.

For example, irrigation water is not applied merely to wet the soil, but to offset drought which might otherwise occur.

Drainage is utilized to overcome water-logging.

Fertilization or cover cropping aids in overcoming partial starvation.

All of the practices can be carried to excess; that is, beyond the point of beneficially affecting the soil moisture or the supply of plant nutrients. This may be merely a waste of money, or may be positively harmful.

PRINCIPAL FUNCTIONS GIVEN

A brief discussion will outline the principal functions of these practices.

Irrigation. As was pointed out, the purpose of irrigation is to overcome drought. Therefore, nothing is gained by irrigating except when drought is imminent. Most kinds of trees, including avocados, are not impaired in growth until the moisture supply in the root zone has approached a condition described as the permanent wilting percentage. When the moisture condition approaches this situation it pays to refill the soil with water in order that growth may continue uninterrupted. A great deal of water is wasted in Southern California nearly every spring by applying heavy irrigations to soils already

containing practically all the water they can hold. This results in not only the loss of water, which is perhaps not serious at that time of year, but the leaching out of valuable plant foods and the over-irrigation of sub-soils. Irrigation water can be applied beneficially only to a soil from which sufficient moisture has been extracted by the trees to justify making an irrigation. At that time the correct amount is that which will replenish the water supply in the root zone, or refill the soil storage reservoir.

In the long run, it may be good economy in the application of irrigation water to spend a little more for labor in soil examination so that the water can be applied to those parts of the soil from which it has been extracted, and the greatest value be obtained from it.

Drainage. is so uncommon a practice in this area that it will not be discussed beyond pointing out the fact that drainage of water-logged soils permits deeper rooting of trees, and therefore makes available more water and plant nutrients.

Cover cropping. Investigations indicate that a supply of organic matter in the soil is of less importance than at one time believed. The principal functions of organic matter are to help regulate the nitrogen supply in the soil and to help maintain that soil condition known as good tilth. If the soil management system is such that tilth is not impaired, organic matter is less necessary. Furthermore, it is often possible to regulate the nitrogen supply in a satisfactory manner through the application of fertilizer more economically than through the growth of cover crops or the use of bulky organic fertilizers. Nevertheless, the use of cover crops is an important operation in many orchards. The best type of organic matter for improving tilth or for regulating nitrogen supply is fresh, readily decomposable material. The addition of such material from time to time maintains the decay processes at the proper level. These decay processes result in the improvement of tilth and in the liberation of available nitrogen over an extended period of time. On the other hand, the addition of organic materials such as straw or sawdust, which are low in nitrogen, results in the type of decay which depresses the nitrogen supply and which improves tilth only very slowly. On rolling lands a winter cover crop is often a great aid in maintaining the soil in place,—that is, in preventing erosion.

Fertilization. The function of fertilization is to supplement deficiencies in the soil rather than to feed the trees directly. The very best soils supply everything the tree requires, and therefore on these soils fertilization is unnecessary. In most of our soils, the chief deficiency is nitrogen. This deficiency can be met by the application of fertilizer, either commercial fertilizer or bulky, organic fertilizer such as manure. In the past, adequate fertilization of avocado orchards has consisted of the application of sufficient bulky organic material to supply approximately 100 to 125 pounds of nitrogen per acre per year, and sufficient cheap chemical concentrates to add an equal amount of nitrogen. The tendency in recent years, as manure has become more scarce and more expensive, has been to get a large proportion of the total supply from the cheaper chemical sources. This is all right provided precautions are taken against obtaining adverse physical effects of these chemicals. The local office of the Agricultural Extension Service will have information as to the proper rotation of various kinds of chemicals, or other precautions which might be taken to avoid adverse effects on particular soils.

Tillage. The remaining soil management practice is tillage, which has little direct effect on either control of moisture or maintenance of fertility. The principal adverse circumstance which arises, that can be corrected by a soil stirring operation, is weed competition; and therefore the chief function of tillage is to control weed competition. Some orchards are now operating under soil management systems in which tillage has been entirely eliminated and the weed control function in tillage has been accomplished through the use of weed killers.

Other important functions of tillage are to mix organic matter or fertilizers with the surface soil and to prepare the land for distribution of water. The mere stirring of the soil is usually a somewhat harmful, rather than a beneficial practice, and tillage should be undertaken only when some highly beneficial result can be accomplished.

The soil management practices are interrelated in such a way that when one is changed it may be necessary to change one or more of the others. The grower should not consider the practices singly, but should study the effect of his whole program on the soil moisture situation and on the supply of plant nutrients.

EXAMPLES OF INTERRELATION

Some examples of the interrelation of these practices follow. If a cover crop is allowed to grow too late in the spring, extra commercial fertilizer may be required to offset the competition between the trees and the vigorously growing cover crop. More water may have to be applied as well. Deep tillage cuts roots, sets the trees back, and may make heavier fertilization necessary. Less frequent tillage will allow plow pans to open up, and so increase the rate of penetration of water that it may be essential to change methods of water application.

Every time a soil management operation is undertaken, the grower has an opportunity to gain or lose, according to whether he exercises good judgment as to the effect of that operation on the supply of moisture and nutrients and also what changes will need to be made in other operations as a result of changing the one in question. Every grower can save money by studying his soil management operations, and deciding beforehand what the purpose of each operation is at that particular time.