

## **The Interrelation of Soil Management Practices**

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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 to wet the soil but to offset drought which might otherwise occur.

Drainage is utilized to overcome water-logging.

Fertilization or cover cropping aid 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.

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

As was pointed out the purpose of irrigation is to overcome drought. Therefore, nothing is gained by irrigating except when drought is imminent, or in other words, when the supply of available soil moisture in the root zone has approached exhaustion. 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 which is at or is approaching the wilting point and 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 therefore the greatest value be obtained from it.

Drainage is so uncommon a practice in this community 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 more plant nutrients.

Cover cropping. Organic matter is exceedingly important in the maintenance of fertility and it is practically impossible to build up large reserves in the soil. Furthermore, the value of organic matter does not come from accumulating in the soil but from its utilization. This means that fresh, decomposable material must be added from time to time to maintain decay processes at the proper level. One of the means of doing this is by growing cover crops which may be capable of supplying one-third to two-thirds of the total organic matter required. The cover crop of course draws on the supplies of moisture and nutrients in the soil and therefore may be a liability rather than an asset if allowed to compete with trees during critical periods, such as the time of blossoming and fruit setting. A cover crop, if properly handled and turned under at the proper time should result in a reduction of the fertilizer bill by approximately ten dollars per acre even at the present low prices of fertilizer materials. On rolling lands a winter cover crop may be a great aid in maintaining the soil itself, 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 deficiencies are nitrogen and organic matter. These deficiencies are met by applications of bulky organic fertilizers supplemented by commercial nitrogenous fertilizers. In times of low prices of fruit it is not profitable to use as large a quantity of fertilizer as can be used in times of high prices. Entirely adequate fertilization should be obtained at present at the cost of less than thirty dollars per acre, buying bulky organic materials to supply approximately 100 to 125 pounds of nitrogen per acre and cheap chemical concentrates to supply an additional 100 to 125 pounds.

The remaining soil management practice is tillage, which has little direct affect 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. Other important functions 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. It should be possible to accomplish all of the beneficial functions of tillage at a cost of around ten dollars per acre per year. It may be necessary to spend somewhat more than this in hillside orchards.

These 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.

Some examples of the interrelation of these practices follow. If no cover crop is grown,

more bulky organic fertilizer will be required. If on the other hand, the cover crop is allowed to grow too late in the spring extra commercial fertilizer may be required to offset the competitions 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 making a study of his soil management operations and deciding before he undertakes them what the purpose of each operation is at that particular time.