The Need of Organic Matter in Fertilizing Citrus Trees

E. F. DeBusk, Extension Specialist in Citriculture
College of Agriculture, University of Florida

From the beginning of citrus fruit cultivation in Florida it has been a general practice to supply organic matter to the soils of citrus groves by growing cover crops and applying various green manure crops and animal manure. Records show that back in the eighties and nineties it was quite a common practice by leading growers to haul into their groves leaves, leaf-mold, muck and other organic materials, in addition to what could be produced by the growing of cover-crops in the grove. This art seems to have been lost in a measure at least when the planting of groves was extended to the light Norfolk sandy soils of the central and southern part of the State, but the practice is being revived again all over the citrus belt. At the present time growing organic matter is given a definite place in every ration plan of grove management. Many of the most successful growers are producing in their groves as much tonnage in cover crops as their conditions will permit, and in addition, hauling into their groves from other lands as much coarse organic material, as it is economical to supply under the particular conditions.

No thinking grower doubts the need of organic matter in our Florida citrus soils. However, with the rapid trend toward a more general use of the synthetic nitrogen compounds, encouraged by low cost and satisfactory results from their uses; and with the facts of the nitrogen-source tests being conducted at the Lake Alfred Citrus Experiment Station available to growers, in which tests Nitrate of Soda and Sulphate of Ammonia are proving to be preferred nitrogen compounds for citrus fruit production, there is perhaps some danger of being misled as to the need of organic matter in fertilizing citrus groves. It is with that thought in mind that this short paper has been prepared.

Fortunately, along with this trend toward a more extensive use of the inorganic nitrogen compounds in fertilizing citrus groves, the practice of growing heavier cover crops in the grove is becoming more general. Growers are giving more consideration to the real value of a cover crop and attention is being turned toward supplying even more coarse organic matter than can be grown in the grove in the form of a cover crop.

This trend toward the production of a more adequate supply of organic matter in the grove from year to year is accompanied by certain modifications of the whole culture program. The practice of keeping the ground of the grove clean throughout the year, no longer has anything to recommend it, except in so far as it applied to a strip along the tree-row of young trees for the first few years. Even there, under certain conditions, cultivation is being replaced economically by heavy mulching around the trees. The general tendency is to do less cultivating, particularly of bearing groves. This is based on sound principles, looking at it from a soil fertility standpoint. One of the principal reasons for cultivating the heavy soils of the north—namely, to increase nitrification—becomes the main reason for not cultivating the sandy citrus soils of Florida. Cultivation increases the rate of decomposition of the organic material and consequently often results in waste of both organic matter and nitrogen. Our main reason for cultivating is to conserve moisture during the dry season by keeping down weeds and grasses. Irrigation is, in a measure, replacing cultivation and making practicable the growing of cover crops over a longer period and consequently the annual production of a greater tonnage of organic matter in the grove.

How much of this bulky organic material does a Florida citrus grove need to the acre and what are the most practicable and most economical ways of supplying it? This is a good question that often comes up for discussion. In answer to the first part of the question I must say I have never seen too much of this organic material in a citrus grove. I have seen more than ten tons of hay-dry Crotalaria produced per acre in a young citrus grove with the best of results. In many instances growers have hauled into their groves a much greater tonnage with the most satisfactory results. In a recent grove management survey in one of the leading orange producing counties in California it was found that fifteen to eighteen tons of coarse organic matter per acre annually was used by the most successful growers. While in grapefruit groves in Arizona up to thirty-five tons per acre is being applied. The bacterial decomposition of organic matter in our light sandy soils is very rapid, owing to their porous conditions, high temperature, and heavy rainfall. It would seem, therefore, that our citrus groves in Florida would be more greatly benefited by frequent and heavy applications of organic matter than those on the heavier soils of the west. It is evident that the usual one-half to one ton of cowpeas, grass, or weeds, grown in a citrus grove in the ridge section is very inadequate in supplying organic matter. Occasionally we hear a grower say too much cover crop, especially beggarweed or Crotalaria, will cause dieback and ammoniation. This idea originates with the grower who tries to bury his cover crop by turning it under with a big plow. Evidently it is the deep plowing—"troubling the soil" and roots of the trees—that causes the dieback and ammoniation, and not the cover crop. In fact we find such citrus diseases as dieback, ammoniation, splitting of fruit, frenching, and withertip

associated with a deficiency of organic matter in such a manner as to point rather definitely to this soil deficiency as an important contributing factor, at least.

It might be worth while to stress at this point some of the functions of organic matter in our sandy citrus soils. Growers are aware of the fact that a cover crop, when left to decay in the grove, supplies plant-food. The fact is generally recognized that through the growing of this cover crop in the grove during the rainy season, water soluble plant-foods are taken up and prevented from being lost by leaching. These plant-foods are returned to the trees when the cover crop is decomposed, and, in addition, the much needed organic matter is supplied. If a legume is grown nitrogen is captured from the air and added to the soil in proportion to the virulence of the organisms in the nodules on the roots of the plant. It is also quite generally known that decaying organic matter is indispensable in supplying energy to useful soil organisms. In the low, wet lands growers recognize the advantage of an abundance of organic matter in the soil in overcoming the effects of an inadequate drainage. More moisture is lost from a given area through direct evaporation from the soil than is used by the citrus trees. This enormous loss of moisture can be greatly reduced by covering the soil with a mulch of organic matter in the form of weeds and grass. Especially is this practice desirable in growing young trees, where, in addition to conserving moisture and furnishing a continuous supply of organic matter, the cost of cultivating to keep down weeds and grass can be practically eliminated. One of the most important functions of organic matter, however, is not generally recognized among laymen growers. That is the part it plays in balancing the plant food in the soil. It is known that through the decomposition of organic matter the capacity of the soil water as a solvent agent is increased. Thus the insoluble mineral plant-foods, such as calcium carbonate, insoluble phosphates and compounds of potassium and magnesium, are made available to the trees. The important thing, therefore, is not the so-called balancing of the plant-food in a fertilizer mixture, but rather providing and maintaining a soil condition under which the citrus tree can take up the maximum amount of the plant-foods in the soil as they are needed. This soil condition can be maintained only by providing an ample supply of organic matter and water at all times. These conditions are most closely approached in the best hammock groves of the State from which comes our fruit of standard quality and trees of greatest vigor.

Since the presence of decomposing organic matter in the soil is essential in maintaining conditions which enable citrus trees to use applied commercial fertilizers most effectively, every plan of grove management should provide for supplying an adequate amount of organic matter.

The plant-food cost constitutes thirty to sixty per cent of the total cost of producing citrus fruits in Florida. About fifty-eight per cent of this represents the nitrogen cost. This being the case, it would seem that a legume cover crop, one

that captures nitrogen from the air, would be the most profitable to grow. This was true in the days of high-priced nitrogen, but with the improvements in the production of nitrate of soda and the advent of synthetic nitrogen, at less than ten cents the pound, and going lower, the chief purpose in growing a cover crop becomes the production of organic matter. The most desirable cover crop of course is the one that will produce the greatest combined value of organic matter and nitrogen. It seems that we have found this happy combination in Crotalaria striata. It is producing two to five tons per acre of hay-dry material in groves on Norfolk sandy soils, and up to ten tons per acre in groves on hammock soils. Crotalaria produces twice as much organic matter, and fixes by nodule bacteria much more nitrogen, than any other cover crop generally grwn in Florida citrus groves.

In addition to supplying as much organic matter as can be produced in the cover crop the practice of hauling into the grove any kind of manure crop available is recommended where practicable and economical. Crotalaria is an excellent crop to grow on vacant lands, or on vegetable farms during the summer, to be mowed and hauled into the grove to supplement the cover crop. In fact any crop of vegetation that yields sufficient tonnage to make it economical, and is practical to handle, may be grown and hauled into the grove. They all have a plant food value in addition to the needed organic matter. A ton of ordinary grass, for example, contains as much nitrogen, phosphoric acid and potash as 175 boxes of citrus fruits. A ton of Crotalaria contains more than twice as much.

The creation of a fire hazard is an objection to bringing coarse organic material into the grove. But this may be overcome in various ways. In the first place provide an ample fire guard around the outside of the grove, especially if it is adjoining woodlands or abandoned properties. More than ninety-five per cent of the grove fires originate outside of the grove. If mulching is practiced the entire area need not be covered at one time. Alternate middles or check rows may be kept clean enough to serve as fire guards. When the need of organic matter in our groves is fully realized ways and means of supplying and handling it will be worked out by each grower under his particular conditions.

Growing manure crops and hauling them into the groves will soon become a general practice in Florida. Herein lies a great opportunity for improving the quality of our citrus fruits and trees and reducing the cost of production. Organic matter, tons of it, and uniform moisture are the factors that tell in quality production.

C. P. Hammerstein, Hollywood: On our muck soils we found volunteer growth with alfalfa. Is that an advantage or disadvantage? It has never been inoculated.

E. F. DeBusk: I would consider it an advantage, most assuredly.

Mr. Smith: A friend of mine sent me some lespedeza seed from Tennessee. Can they be utilized in Florida?

E. F. DeBusk: In the northern part of Florida, but not to any great extent in the central and southern part of the State because of soil conditions.

Mr. Waite: How do you control the pumpkin bug if you keep the Crotalaria until it is dry?

E. F. DeBusk: Prof. J. R. Watson will tell you about that.

Member: What do you think about this cull fruit in groves, that is aside from the Mediterranean Fruit Fly?

E. F. DeBusk: Aside from that, it is good practice to incorporate it into the soil.

Member: What benefit can be derived from it?

E. F. DeBusk: Yes, there is plant food value to it, and you are adding organic material, but under the present conditions, we can't do it.