

THE FLORIDA AVOCADO INDUSTRY—A SURVEY

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As the result of an invitation to judge citrus and other subtropical fruits at the South Florida Fair, held at Tampa, the writer recently had the opportunity of conducting a survey of the citrus and avocado industries of that state. During the month which was spent in this work most of the principal citrus and avocado producing sections were visited and interviews held with many of the leading growers and investigators connected with the various federal and state agencies. The trip proved to be an exceedingly pleasant one, although at the same time in many respect a rather strenuous experience. By no means the least of the pleasures of the trip were the very cordial reception given to the writer throughout the entire journey and the many courtesies extended to him. In the absence of these it would have been altogether impossible to cover the main citrus and avocado sections of Florida in the short time available. The writer gladly acknowledges the most valuable assistance which he received from the many good friends he made during the course of the survey.

ECONOMIC CONSIDERATIONS

Status of the Industry

Approximately eighty-five per cent of the present bearing avocado acreage in Florida is located in Dade County, which is situated at the extreme southeast tip of the Peninsula. The bulk of these plantings occurs in a relatively narrow strip along the east coast, extending from Miami, the county seat, to Homestead, some forty miles southwest. The rest of the bearing acreage occurs principally in small plantings on the west coast, extending from St. Petersburg south to Fort Myers. There are a few small groves scattered through the central part of the state, mostly located close to the larger lakes, which afford some measure of protection from damaging winter temperatures.

The first record of the avocado in Florida relates to introductions from Mexico to Miami made by Henry Perrine in 1833, although it is probable that the Spanish brought it to Florida from Central America at a much earlier period. In any event, its first commercial development occurred in the vicinity of Miami and Palm Beach, where until recently the greater part of the older plantings were seedlings occurring principally as groups or rows of trees in or near the door yards of residences. Much of this acreage has been destroyed by the recent phenomenal subdivision boom, which reached its most frenzied developments in the areas immediately adjacent to these two cities. A similar condition developed in the vicinity of St. Petersburg, on the west coast, with the exception that subdivision activities in that section have apparently not yet reached their peak.

The commercial era in avocado culture in Florida started somewhat earlier than in California, beginning some fifteen or twenty years ago when the first commercial groves of budded varieties were planted in the region adjacent to Miami. Plantings increased rather slowly for a few years and were distributed not only on the southeast coast, but also in other parts of the state as well. A marked stimulus to planting occurred immediately following the war, which attained its height in 1924, just before the subdivision boom hit its stride. At that time it is estimated by those most closely in touch with the situation that the commercial plantings had reached a maximum of between 3500 and 4000 acres for the state, of which approximately 1000 acres was of bearing age, the bulk of the remainder being not over two or three years old. Little or no planting has occurred during the past two years.

Heavy floods and rains during the fall and winter of 1924 destroyed hundreds of acres, and damaging frosts during the past two years have also caused heavy losses. The bulk of these reductions in acreage were of young plantings which were improperly located. As an illustration of the acreage reductions which occurred from these two causes may be cited one planting of 700 acres, of which less than 200 acres remains at the present time.

The unprecedented subdivision activity of the past two years has eliminated much of the bearing acreage of seedling trees, already referred to, and some acreage of bearing trees of budded varieties. While the actual losses of acreage by subdivision have been considerable, both of young and bearing trees, but principally the latter, a large part of the avocado plantings which have been subdivided have merely been sold; the trees have not been destroyed. They have temporarily gone out of production on account of neglect of fertilization and will not again come back into production until the boom is over and conditions settle down and become more or less normal. The trees will not die in the meantime, however, but only await again being fertilized, when they will resume bearing.



Avocado Planting near Miami



Four-year-old Avocado Trees in Florida

Present Acreage

Considering losses of acreage from all causes and the acreage of young plantings which have reached bearing age during the past three years, those best informed on the situation estimate that at the present time the total acreage for the state does not exceed 2000, of which approximately 800 is of bearing age and the rest less than five years old. Of the bearing groves some 700 acres are located in South Florida, approximately 600 on the east coast and 100 on the west coast. The remaining 100 acres is scattered through the central part of the state. The bulk of the 600 acres on the east coast is temporarily out of production on account of neglect arising as an effect of the boom, but it is believed that in two or three years this acreage will likely be back in production again. By far the greater part of the 1200 acres of non-bearing trees is located in South Florida, approximately 900 acres, the rest being scattered through the central part of the state. Much of the young acreage in South Florida is located in the Everglades areas in the immediate vicinity of Lake Okeechobee, where avocado culture is as yet an unproved venture. The remainder occurs principally on the east coast, much of it having been subdivided and partly or entirely sold, and on the west coast in the Fort Myers section, where as yet subdivision has not exerted any marked influence.

To sum up the acreage situation, it may be said that of a possible maximum acreage of 4000 in 1924, fully fifty per cent has been destroyed either by floods, frosts or subdivision. Much of the acreage which remains is temporarily being neglected and is not producing. A large part of the young acreage is located in a region where avocado culture is still experimental. It seems clear, therefore, that in comparison with Florida, California is today in the lead in both acreage and production. While the acreage of bearing trees in Florida is probably somewhat larger than is the case in California, the neglect arising from subdivision activities has so reduced production as to place California in the lead—at least for the next two or three years.

Production Figures

Although data concerning the production of avocados in Florida is exceedingly difficult to obtain, by comparing and checking the information secured from various sources, and in turn subjecting this to analysis on the basis of bearing acreage and average crops, the conclusion seems warranted that the largest avocado crop ever produced in Florida did not exceed 450,000 pounds, or slightly better than 12,000 crates of 40 pounds each. A representative of one shipping concern which is said to handle approximately 80 per cent of the Florida crop, reported that during the 1924-25 season his concern shipped more avocados than the California Avocado Exchange. The production for the present season, for reasons above given, will in all probability not reach half that amount, possibly not even one-third. In view of the large acreage of young trees coming on in California and the low production which may be expected in Florida during the next two or three years, it seems not at all unlikely that from now on California will lead in production.

Marketing Methods, Yields and Returns

Fully 90 per cent of the Florida avocado crop is shipped to outside markets, the local consumption being almost negligible. New York is the principal market and has always taken the bulk of the crop. Until the recent amendment to the Fruit Standardization Act went into effect, San Francisco has been considered a good market for Florida avocados, and even Los Angeles, though to a lesser extent on account of the competition with local production. Small shipments have also been made to other markets. The chief competition has been Cuban avocados coming in at the port of New Orleans, which have crowded the Florida shippers out of the central and middle western markets.

Very few of the growers are shippers, the common practice being the sale of the crop on the trees at an agreed price per dozen or per crate orchard run.

Prices received by the shippers on the New York market show a range of from \$4.00 to \$40.00 per crate, depending somewhat on variety, but largely on season. The shipping season usually begins about July 1 with Pollocks a very large and choice variety which generally commands a very good price. Opening prices range from \$8.00 to \$10.00 per crate, and as the season progresses the September average is frequently not better than \$5.00 or \$6.00 per crate—sometimes as low as \$4.00. Toward the end of the season prices tend to pick up and very late Trapps in January or February frequently bring \$30.00 to \$35.00 a crate, sometimes even higher. An average of \$6.00 per crate (15 cents per pound) is regarded as quite satisfactory. As near as it could be got at, it appears that the growers receive in the neighborhood of eight to ten cents per pound on the trees, which is apparently regarded as a satisfactory price and, to judge by the growth of the industry up until the real estate boom, a reasonably profitable one.

The range of yields from good bearing trees was reported as from 100 to 300 pounds per tree. There are, of course, in Florida as in California, many fine old trees which are yielding much in excess of these amounts but the growers seem to regard 200 pounds per tree as a satisfactory and profitable yield.

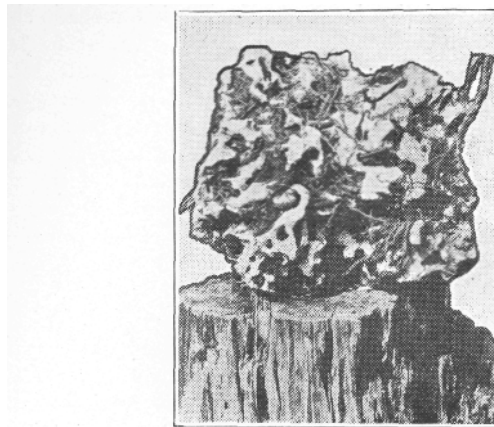
Cost of Production

Accurate figures on costs of production were not available, but there is ample evidence that they are relatively low in Florida. The two principal items of expense are the cost of fertilizers, of which large amounts are used and costs of spraying for control of insect pests and diseases, which will be referred to later. Few, if any, of the groves are equipped for irrigation, and the amount of cultivation practiced ranges from none to three or four times per year.

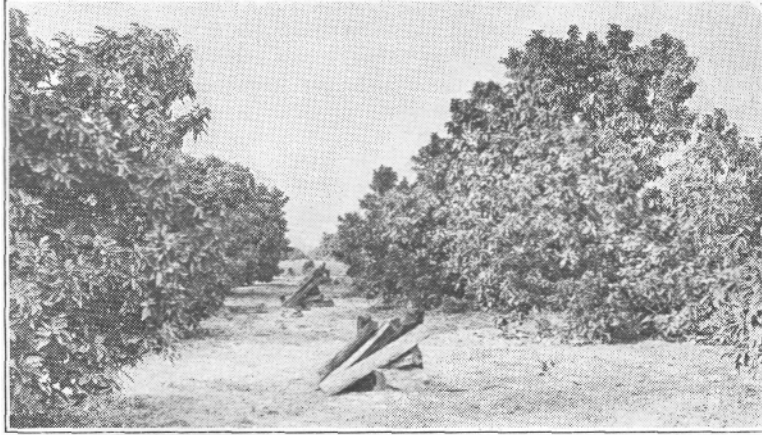
On the other hand, present costs of establishing an avocado grove are relatively high. Land adapted to avocado culture costs from \$400 to \$2000 an acre, depending upon location and suitability for subdivision. Clearing the land of the heavy pine growth and putting it in shape to plant, together with the cost of the trees and their care for the first four years will cost an additional four or five hundred dollars per acre. All costs are, of course very high at the present time on account of the influence of the boom, and it is probable that as normalcy is regained these will decrease somewhat. One first-class three-year-old 40-acre grove was visited which had cost \$21,000 to develop, the land having been purchased at \$35 per acre. Land in that same neighborhood could not be had for less than \$2000 per acre at the time this survey was made.

Possible Future Developments

No economic consideration of the avocado industry in Florida would be complete without calling attention to a most important fact—namely, that the industry as it now exists is based almost wholly on the growing of varieties of the West Indian race, by far the tenderest group of avocados known. More than 95 per cent of the Florida avocado production consists of West Indian varieties, although some of the younger plantings are of Guatemalan varieties and many are of West Indian-Guatemalan hybrids. This fact has numerous important applications, both with respect to present and future developments and especially in relation to competition between Florida and California.



Lime Rock "Soil" Showing How It Is Permeated by Tree Roots



Orchard Heating in Florida, Showing Piles of Wood Ready for Lighting

The West Indian varieties certainly find a most congenial environment in South Florida, as is evidenced by their remarkable vigor of growth, and the many fine old trees which are to be seen. One group of three trees was observed which were between 50 and 60 feet tall and had trunk diameters of between 30 and 36 inches and were said to be sixty years old. Although given practically no care, these trees were in splendid vigor and producing large crops.

Based on West Indian varieties, however, the Florida avocado shipping season covers only approximately half the year, from July 1st to January 1st. Occasionally in an early season shipments may begin by June 15th, and the Waldin, one of the newer of the West Indian varieties, in some sections will hang on the trees as late as February, but this seems to be about the maximum shipping period for West Indians. There is thus a great need for varieties which will fill in the gap and permit of shipments all the year round. Experience has indicated that some of the Guatemalan varieties will do this, for which reason the newer plantings are primarily either pure Guatemalan varieties or hybrids between the two, several of which—the Winslowson and Collinson especially—are quite promising. Moreover, prices for winter and spring fruit have averaged better than for summer or fall fruit, which has provided a strong incentive to try Guatemalan varieties. The result will undoubtedly be that within a few years Florida will be shipping avocados every month in the year, and quite likely some of the same varieties now shipped from California.

On account of their greater hardiness the Guatemalan avocados can be successfully grown over a very large part of Florida—certainly throughout the central part of the state, where at the present time commercial plantings are almost negligible. And varieties of the Mexican race, of which there are almost no plantings in Florida, seem to do well in the more northern parts of the state, as at Gainesville and other points situated even further north than the present citrus belt. If the Guatemalan varieties should prove to be unusually profitable in Florida, it is entirely conceivable that large plantings of Guatemalan and Mexican varieties might be made in the central part of the state, where there is still much cheap land available, and where varieties of these races are known to do satisfactorily. To be sure, the recollection of disastrous freezes, which

in the past at intervals of approximately thirty years have almost wiped out the Florida citrus industry and caused it each time to move further south, may prove a deterrent sufficient to prevent the development of an avocado industry in these regions.

The difference in the character of the avocados at present shipped from California and Florida is also a matter of importance in its influence on market demand and preference. It is useless to argue as to which is the better fruit, a West Indian or a Guatemalan, for tastes differ and are determined largely by past experience and personal preference. The very large West Indian fruit, with its relatively low fat content, has consistently brought top prices on the New York market and will doubtless always have sufficient devotees to maintain itself in good market demand. In a similar way the rich Guatemalan varieties will unquestionably always rank favorite with those acquainted with their many good qualities. But for the great bulk of the consuming public who have yet to learn the joys of eating a properly ripened avocado, it must remain purely a question of advertising and dealer service work. The California growers are certainly in a much more favorable position to influence the consumptive demand than are the Florida growers. Indeed, it appears doubtful whether the Florida growers will reach this stage for many years to come—perhaps not before they are ready to take advantage of the pioneer work done by their California friends by producing and shipping varieties of the Guatemalan race.

AVOCADO CULTURE

Climate

In order to gain an understanding of the reasons why so many of the operations in Florida citrus and avocado groves are at variance with those practiced in California, in many cases almost the exact opposite, it is necessary to have in mind certain features of the climatic conditions in the two states. From the point of view of winter temperatures, the two states are not markedly different. It is somewhat warmer in South Florida than in Southern California, though the difference is not so great as some would have it. Summer temperatures in Florida, on the other hand, are not so high as in Southern California, though the heat is much more oppressive on account of the greater humidity. The daily variation in temperature is very much less, however, so that with approximately the same length of growing season the total amount of heat is considerably greater. This accounts in large part for the unusual vigor of growth of both citrus and avocado trees, previously referred to, and for their coming into commercial production at a somewhat earlier age. Avocado trees were observed on the muck lands near Lake Okeechobee which had made a growth of fifteen feet in two seasons and were carrying quite a respectable crop. This is not the average condition, however, the rate of growth being much slower on the other types of soil. The unusual amount of heat in the growing season also accounts for the early ripening of the different varieties, which are normally from six weeks to two months earlier than the same varieties in California.

By far the greatest difference in the climates of the two states, however, is in the moisture factor. Surrounded by warm ocean water, filled with lakes, and subjected to a summer rainfall of from 40 to 60 inches, makes the Florida climate a distinctly humid

one, in marked contrast to California, which enjoys an arid climate during most of the year. The influence of the humidity has much to do with the orchard management practices in vogue. Ample summer rains make it unnecessary to practice irrigation; indeed, the superabundance of rainfall makes it absolutely essential that the avocado groves be provided with good drainage. Among the outstanding lessons learned by Florida avocado growers from bitter arid costly experience is the fact that the avocado tree will not stand water about the roots, especially during the growing season. The high atmospheric humidity which obtains during most of the year also favors the occurrence of certain scale pests and of several important diseases of the fruit and foliage, neither of which are of much importance in California, It is also probably true that the high atmospheric humidity favors the production of a type of fruit much more easily bruised and therefore of poorer inherent shipping quality than that produced under the influence of our dry summer heat.

Other important effects of these climatic differences unquestionably exist, making possible certain practices which have not succeeded in California. Among these were a number of special interest to the writer. A propagation method in common use was observed which, so far as can be learned, is employed successfully elsewhere only in Hawaii, another humid region. This method involves sprouting the seeds and when the sprouts are five or six inches long and before they have differentiated into bark, cambium and woody elements, digging them up and grafting them either by the cleft method or by fitting, using soft, tender herbaceous tips and dipping the scion and unions in warm paraffin or wrapping them with thin rubber tissue or some similar material. This method is surprisingly simple and successful, but probably would fail in California on account of the drying out of the scions and the roots of the seedlings. Still another influence of the moisture factor relates to the problem of soil fertility and will be referred to a little later.

The combination of heat and humidity which characterizes the Florida climate tends to keep the evergreen subtropicals, such as the citrus fruits and the avocado, in active growth throughout the entire year, a condition which is undesirable for a number of reasons. Among the most obvious of these is the increased danger of damage from low winter temperatures, which constitutes a never-to-be-forgotten menace to subtropical fruit culture in Florida. Under the normal seasonal conditions a state of partial dormancy is brought about by the depletion of the soil moisture during the usual dry fall months of September and October. If for any reason the normal dry period does not occur, or if it is broken by heavy rains accompanied by warm weather, the trees continue to grow and are very subject to frost damage. It was a condition of the latter type following a fall freeze in 1894 that rendered the trees so susceptible to frost damage in February, 1895, when the citrus industry was almost destroyed. In California the trees normally enter a condition of dormancy in the fall, which in this state however, is not only induced by drying out of the soil, but is usually accompanied by relatively cool weather. The state of dormancy normally experienced with both avocado and citrus fruits in California seems to be much more complete than that normal to Florida, which is probably the reason why the same degree of frost in the two states usually causes much worse damage in Florida.

Moreover, the Florida growers have observed that in the years of warm winters and wet

falls when the trees continue to grow through the winter with no well-defined rest period they fail to put out a good bloom in the spring, with a corresponding poor crop that season. It has also been noted that if the normal dry spell of six weeks or two months in April and May is prolonged, which sometimes occurs, the most of the bloom drops off and later in the summer, after the rainy season starts, a new bloom is produced. The conclusion which has been reached from these observations, and which is supported by some experimental evidence, is that a checking of the growth and a passing through a brief rest period is necessary to fruit bud differentiation, a conclusion somewhat in harmony with the ideas of certain California lemon growers who augment the fall bloom by omitting an irrigation in July or August.

Soils

Another outstanding difference between the two states which has much to-do with differences in orchard practice relates to soil conditions. For the most part Florida soils are prevailingly light, consisting largely of coarse sands frequently underlaid with organic hardpan, clay strata or lime rock. The high pine soils of the central part of the state usually have good under-drainage. The flat woods and prairie soils usually have impervious underlying strata and require drainage. The hammock soils, which are somewhat heavier and in many respects the best soils, either have good drainage or not, according to whether they are high or low. The peat or muck soils are deficient in mineral constituents and for the most part are subject to high water table or flooding during periods of heavy rainfall. Among the most peculiar soil types in the state are the limerock soils of the southeast coast, on which nearly all of the present bearing avocado acreage is situated. This soil is a solid rock of limestone formation, in which the trees must be planted with a crowbar or stick of blasting powder, but upon which they thrive and do wonderfully well.

With the exception of the muck soils, all Florida soils are deficient in organic matter. During the warm growing season, when biological activities in the soil are most active, the almost daily rainfall leaches out the soluble constituents about as fast as they are formed. The natural result is that they are about as sterile a set of soils as can be found anywhere, a condition which is reflected in the fact that heavy fertilization is required to grow even a fair crop of Bermuda grass.

Suffice it to say that all crops in Florida must be fertilized and the avocado is no exception. The fact is that in Florida the avocado has been found to require considerably more fertilizer than citrus—on an average about twice as much. There may be a valuable hint for the California avocado grower in this experience. Further, it has been thoroughly demonstrated in Florida that the avocado tree can use much more organic nitrogen than a citrus tree, thriving and producing heavy crops on a fertilizer schedule which is certain to cause that mysterious disease, die-back, in citrus trees. On account of the leaching action of the rainfall, working the fertilizer in the soil is not required. It is necessary, however, to put it on in from three to five small applications during the season. For full bearing trees about sixty pounds of commercial fertilizer running four to five per cent in nitrogen content is applied per year. Stable manure has also been found to be beneficial.

Cultural Practices

Comparatively little cultivation is practiced, as there seems to be little necessity for it. With the exception of the relatively short dry spring period, there is no need of conserving the moisture by keeping the weeds down, and in some seasons even that need does not occur. It is quite probable that the heavy growth of weeds or summer cover crops, mostly the former, which characterizes the average avocado grove in Florida, is a decided benefit by removing the excess water from the soil during the rainy season and shading the ground and retarding oxidation of the organic matter. Cultivation to keep the soil receptive to moisture penetration is not required, as the soils are prevailingly so open and porous that the rainfall, unless extremely heavy, soaks in about as fast as it comes. Moreover, on account of the shallow rooting of the trees, which is in turn a reflection of moisture and aeration conditions, cultivation to even a moderate depth would probably do considerable damage to the root systems. To cultivate as much and as deeply as is the common practice in California would be regarded as suicidal in Florida. And, finally, in the case of the limerock soils, even though cultivation were beneficial, it would require nothing short of a heavy duty tractor and a road scarifier to make any impression whatever.

Practically no pruning is done other than to remove broken or badly interfering branches.

Pests and Diseases

The principal insect pests are the pyriforme and dictyospermum scales and the red spider. The scales are not regarded as difficult to control except in the nursery, and the usual control measures employed, where any are used at all, is spraying with oil emulsions. The spider is not serious except during dry spells and is easily kept down by either dusting with sulphur or spraying with weak lime sulphur.

The principal diseases are scab, which affects both the leaves, young tender growth and the fruit, and black spot and blotch. These are all controlled to a greater or less extent by spraying with bordeaux mixture. All cause serious blemishes of the fruit and decrease its salability. The black spot, caused by the citrus withertip fungus, is much the most serious, however, since the spotting of the rind caused by the fungus penetrates the flesh, sometimes into the seed, and entirely spoils the fruit. Occasionally a form of mildew affects the foliage, but it is not regarded as serious.

Orchard Protection

In the sections exposed to strong sea breezes it has been found desirable to use windbreaks, and many of the plantings in such districts are both provided with windbreaks and are planted close in the rows so as to form solid hedge rows. Many of the groves have good wind protection from the pine forests which surround them.

Some of the groves, especially in the central part of the state, are equipped with orchard heaters, either coke or oil. Most of the groves which have frost protection, however, are protected by means of burning wood, which is piled in the middles and banked around

the edges and ignited with burning torch fuel poured on small piles of rosin. The majority of the young trees, especially in the central and northern sections, are protected by mounding soil up above the bud unions, so that in case they are frozen new growth will put out above the bud unions.

Methods of Establishing Groves

Since irrigation is not required in establishing a grove, no effort is made to level the land, although much of the flat wood areas planted to avocados are naturally quite level. On lands requiring drainage the tree rows are first ridged and the trees then planted on mounds set on the ridges. Much of the clearing is only partially complete, the stumps of the pines and other trees being left excepting those occurring at the points where the avocado trees are set. The trees are usually planted either in October and November or in March and April, because the soil is normally warm at these periods. It is sometimes necessary to irrigate the young trees once or twice before the rainy season begins, after which they take care of themselves. They are usually cut back to a single stalk at the time of planting.

The bulk of the nursery trees are grown in much the same manner as is followed in California, the seeds being sprouted in seed beds, transplanted to nursery rows, budded in place and grown for a season or two, and then dug and placed in small wooden boxes instead of being balled.

Varieties and Pollination

The principal West Indian varieties grown are the Pollock, Trapp and Waldin. Guatemalan varieties in favor are the Taylor, MacDonald, Eagle Rock, Linda, Queen and Taft. Of the Guatemalan-West Indian hybrids, largely planted in recent years, the two most popular are the Collinson and Winslowson, sometimes known as the Rolfs.

A few Mexican varieties have been planted on a small scale, including the Puebla, San Sebastian and Gottfried.

Of the Mexican-Guatemalan hybrids the Fuerte and Lula are favored. Of the varieties grown in California those most cussed and discussed are the Taft, Linda and Fuerte. Taft has been erratic in Florida, sometimes bearing early, sometimes late, but always a good fruit. The Linda is liked because of its size and season, following soon after the West Indians are gone. Fuerte is generally condemned as an erratic and shy bearer, but is claimed by some to bear splendid crops every year if heavily fertilized.

The majority of the growers feel that pollination takes care of itself in the case of the West Indian varieties, but believe that it may be of importance with the Guatemalan varieties.