

THE AVOCADO IN FLORIDA AND OTHER LANDS

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To you who are growing the avocado here in California, a discussion of the culture and importance of this fruit in Florida and other regions may not be entirely without interest. While local conditions must largely control your methods and practices, the experience gained in other regions, especially in Florida, where a few men have been digging away at this problem for fifteen years, cannot fail to throw some light on certain questions which are arising in California. Naturally enough it will require the test of time to determine how far you can go in applying the methods of Florida and other more strictly tropical countries.

The proximity of this region to the avocado growing districts of Mexico has enabled you to come in close contact with the varieties, the cultural practices, and the superstitions of that country. It will probably be better for me, therefore, to limit my remarks to observations which I have made during the last three years in other parts of tropical America, principally in the West Indies, and most important of all, in Florida. It is in Florida only that there has been real development of avocado culture along modern lines, if one excepts the few budded orchards which have been planted in Cuba and the Isle of Pines. One cannot marvel at the lack of commercial avocado orchards in tropical America, for it must be remembered that in the tropics generally there is an astonishing lack of systematically cultivated groves of every kind, with the exception of those few fruits, such as the banana, whose culture has been undertaken on an extensive scale to supply the ever increasing demand of northern markets.

Recently we have been hearing a great deal regarding the unusual food value of the avocado. We have always known that it ranked high among food products, but when we see analyses, such as some of those which have recently been made at Berkeley, showing that in certain varieties the oil content is as high as 30 per cent, we are inclined to ask why was not the extraordinary value of this fruit earlier recognized, and why were not orchards planted years ago to supply the markets with it? To the first query I believe we can truly say that its food value has been fully recognized by those peoples who are intimately familiar with it, such as the Cubans, the Mexicans, the natives of tropical America generally and those northerners who have lived or traveled in the tropics. But it was never realized here because until very recently we did not know we could grow the avocado—indeed we scarcely, knew there was such a fruit.

One can scarcely appreciate the importance of this fruit to the peoples of tropical America until he visits some such region as Cuba, and sees the enormous quantities of avocados piled in the markets, and finds how universally the people are using them as a substantial addition to almost every meal. It was only last summer that I had this matter

brought home to me, while traveling through the island of Cuba in company with a young Cuban from the Experiment Station at Santiago de las Vegas. We ate avocados and we ate them every day. Being accustomed to take mine with a little seasoning, I called for salt and lemon juice. He scorned the idea of adding anything to the avocado, and after cutting the fruit in slices, mixed it with whatever dish he happened to be eating at the time. He was especially partial to a mixture of fried eggs and avocado. Certainly, from the point of view of food value, this was a rich combination. The Cubans sometimes take a little salt with their avocado, and they are by no means averse to a guacamole—avocado salad—but I do not think any true Cuban believes, right down in the bottom of his heart, that you can improve the avocado very much by adding anything to it.

Why has not the avocado been more extensively planted in tropical America on a commercial scale? There are, I believe, two principal reasons for this. In the first place there are very few fruits that have ever been cultivated in the tropics on a commercial scale, as we understand that term, and secondly, there is the difficulty of propagating the avocado asexually and thus obtaining in quantity trees of known, desirable varieties which would fulfill in a reasonable degree the demands of the market. We cannot, of course, assume that had some easy means of vegetative propagation been known to the Mexicans, they would have been flooding our markets years ago with splendid avocados; this would probably not have been the case, but if the avocado had been propagated like the banana and the pineapple I believe its culture would have been much more extensive in the tropics than it is at the present time. Cuba, with all her seedling avocados, probably does not grow one-half the amount that could be consumed, and would be consumed were choice fruits available in quantity at a reasonable price. It takes, of course, energy and organization to develop a great avocado industry, just as it has to develop a great banana industry, and so far the requisite energy and organization have not been forthcoming in the tropics. After all these years are California and Florida going to step in and take the matter out of the hands of our tropical neighbors? It appears so. The beginning which has been made in Florida, and which will be spoken of in detail later on, has served to demonstrate the possibilities that lie in avocado culture, when it is put upon the same modern and substantial basis as the culture of our important temperate fruits. The beginning which is now being made in California will, I feel sure, further illustrate the splendid future of the avocado in this country, a future for which many of us have the most sanguinary hopes.

It is somewhat peculiar that the avocado is not more abundant in Porto Rico. While it is one of the common fruits, it does not seem to be nearly so abundant as it is in Cuba, and I do not believe the seedlings will compare well in quality with those of Cuba, though they are all of the same type, i. e., the South American. I have heard of no commercial plantations of budded trees in the island, but some of the American colonists are contemplating the planting of small orchards. Porto Rico probably has several advantages over Florida, chiefly in the matter of better soil, but it will take experimentation to determine the best varieties for commercial cultivation. There seems to be no reason why Porto Rico may not compete with Florida in the markets of the eastern United States at some future time.

Next to Mexico, Cuba is certainly one of the greatest avocado regions of tropical

America. The superiority of Cuban seedlings to those of many other regions has been noted by several observers; Prof. F. S. Earle considers that the best Cuban avocados have no superiors in the tropics. This is, of course, looking at the matter from the Cuban standpoint, for everyone knows by this time that Cuban avocados are not the ones to grow in California. It is from Cuba, however, that Florida has obtained practically all her varieties. Walking through any one of the large Havana markets during August and September one can find an endless variety of avocados, some of them excellent, others fair, but very few which are really inferior. They are all of the South American type, which is, I believe, the only one grown in Cuba, if one excepts the few trees of the Mexican and Guatemalan types recently introduced from California. These fruits are produced by seedling trees scattered by the roadsides, in backyards and fence corners, and in all sorts of odd places which are not usually occupied by fruit trees in the United States. I believe it can truthfully be said that the avocado tree which receives systematic care in Cuba is very rare. Most of the trees receive no cultivation whatever, but the soil is excellent, and they seem to thrive. Propagation is by seed, but in recent years the government and some of the most progressive horticulturists of the island have taken up budding with fairly good results.

The fruits which go to market are picked usually before they are fully ripe, and when they reach Havana they are still hard. They are packed in sacks, boxes, or often hauled into town in a cart without any packing whatever. I have stood in the Tacon market at Havana and seen these fruits which were brought in from the country sorted into piles of different sizes, and then thrown from the ground into nearby wooden bins, a procedure which would certainly have been disastrous to a fruit commencing to ripen, and which can scarcely be recommended under any circumstances. For export, the Cubans pack the fruits in empty kerosene boxes, orange crates, or barrels, using no wrapping paper or packing material of any kind. The method is rather crude, and one hears a good many reports of Cuban fruit reaching New York in poor condition. In some cases, however, the loss is due more to other conditions than to careless packing, such as picking overripe and allowing the fruit to heat in transit.

There are a few good groves of Trapp avocados in the island, and also in the Isle of Pines. These have been planted by Americans, and have only recently come into bearing. They have demonstrated that the fruit will not hang on the tree so long in Cuba as it does in Florida, and also that the trees will make much more rapid growth. Failure to remain on the tree until late in the fall is something of a drawback, inasmuch as the highest prices are obtained in late fall and winter. The Guatemalan avocado may solve the problem, however, and supply fruits during the winter and early spring. I saw at Guanajay, about an hour's ride from Havana, several young Guatemalan trees imported from California which were bearing their first fruits, and seemed to be making splendid growth. This type of avocado promises to be of immense value in Cuba as well as in Florida, because of its habit of ripening in winter and early spring. It is much earlier in Florida than it is in California, as will be mentioned later on.

The future of avocado culture in Cuba probably lies in the cultivation of winter and spring-fruiting varieties. The profits from shipments of summer-ripening fruits certainly cannot be great, when one considers the loss in transit and the low prices obtained during the summer season in New York and other eastern markets. When good

avocados can be purchased wholesale at \$12 to \$25 per thousand, as they are in Havana during August and September, they can be shipped north and a profit made, even with considerable loss of fruit in transit, but the big possibilities of the future seem to lie almost exclusively in the winter bearing type.

In south Florida we have an entirely different state of affairs. There are plenty of seedling avocados, and lots of cheap fruit during the summer months, but the present avocado industry has been built upon a more substantial and profitable basis. There are approximately 200 acres of budded trees now in bearing, with about an equal area recently planted. Of this acreage, more than 95 per cent is planted to the Trapp variety. It can be truthfully said that the late-fruiting habits of this avocado have made possible the present development of the industry. The Trapp, however, is not an especially choice avocado. I am convinced that we can find a number of others in Cuba which will be just as late, and considerably better in quality. On this latter point opinions differ. A good many of the Florida growers think the Trapp the acme of perfection; a few others, who are entirely unprejudiced in their opinions, feel that the Trapp might to advantage have a smaller seed and richer flavor. Probably it will be superseded some day by a better fruit, but in the meantime Florida is going to grow Trapps, and rightly so, for past experience seems to show very plainly that in matters of this kind it is poor economy to search indefinitely for the ideal fruit and produce nothing in the meantime. Credit must be given to that indefatigable pioneer, George B. Cellon, for having shown considerable sagacity when he picked out the Trapp. Undoubtedly it was the best seedling available in south Florida at the time it was chosen. The Guatemalan varieties bid fair to take first rank in the near future, and Mr. Cellon was the first orchardist to see it. Two years ago, when the seedling Guatemalan avocados came into fruit at our Miami Plant Introduction Garden Mr. Cellon saw the trees and was interested. Somewhat skeptical at first, he sent to California for budwood of the best Guatemalan varieties of local origin as well as a number of the imported ones. He cut back a young orchard of Trapp avocados and top worked them to Guatemalans. Today, less than two years from the insertion of the buds, he has fruit on seven or eight of those trees, representing five varieties, and when I last saw him in September he remarked to me, "The other fellows can wait if they want to, but I am going to plant Guatemalan avocados." And suiting the action to the word, he has already set out two or three acres, all that he had stock to plant. We have three seedling trees of the Guatemalan type at our Miami Garden, one of them from a tree here in Los Angeles. They have been in fruit two or three years, and there is every indication that this type is admirably suited to south Florida conditions. A point of almost greater interest is that all these trees ripen their fruit a month to two months earlier than most of your varieties here in California, and I suspect the warmer climate of Florida is going to result in changing the season, making it more nearly what it is in Mexico and Guatemala. We will know in another year or two. Mr. Cellon is counting on this feature to eliminate competition between Florida and California in the eastern markets. He believes they can supply the late fall trade with Trapps and the winter trade with Guatemalans. Late spring and summer, he says, will be left to California. It is up to you to say whether you are going to stand for this or not!

Nearly all of the budded avocado orchards of Florida are to be found in the vicinity of Miami. On the West coast there are a few plantings, notably at Sarasota, a short distance below Tampa, and at Fort Myers. The real avocado region, however, is the

Miami limestone belt, which is a narrow strip of land along the East coast between Fort Lauderdale on the north and the uppermost keys on the south. Its greatest width is not over nine miles, and the maximum elevation is about 20 feet. When I first went to Florida from California two years ago this country looked rather uninviting to me, but I have become accustomed to it now, and the more I see of it the more I like it. It has its drawbacks, of course, but I am convinced that it is destined to be a great avocado region one of these days.

The surface of the land is rough, jagged limestone, sometimes overlaid with as much as a foot of sand, sometimes almost bare, with only a little soil in the potholes. Where the dense native growth called hammock has been cleared off it is richer, and below Miami, from Larkin to Homestead, there is a superficial layer of reddish clay, which is, I believe, the best avocado soil in this region. During this past spring and summer, it has been impressed on me that the groves south of Miami, on this heavier soil, are doing better than are those north of Miami, where there is nothing but light sand over the rock. The thing resolves itself into this: The avocado likes a deep, heavy loam, with plenty of moisture. We cannot supply this in Florida, but the nearer we can approach it the better, and I believe the reddish soils below Miami, even though shallow, are the best for the avocado. It does not seem to be at all objectionable to have the rock close to the surface; there is strong evidence, in fact, to indicate that the presence of the rock serves to control the moisture supply, and the trees do not suffer during a period of drought as they do on deep sand. I really think it would surprise you to see the excellent growth made by some of the groves south of Miami. It takes a little fertilizer to turn the trick, but there are a good many trees, especially seedlings, that get very little of it indeed, and still they give a pretty good account of themselves.

There are very few diseases or pests which cause the orchardists much concern. There is one difficulty, however, which has been puzzling everyone, and has probably caused more loss than all other factors combined. The young trees, especially of the Trapp variety (which seems to be weaker constitutionally than Pollock and others), will frequently fail to "take hold" when set in the orchard, and after struggling for awhile, and making a few growths with small, ill-shapen leaves, will die back from the ends of the branches and eventually have to be replaced. This trouble sometimes attacks trees which have made good growth for several years, and are apparently healthy. They commence to die at the ends of the branches, the leaves drying up and the bark turning brown, and after a short time the old wood is reached. There have been many attempts to explain this peculiar disease, some blaming it on lack of sufficient plant food, others thinking that it might be caused by the anthracnose fungus (*Colletotrichum gleosporioides*). The subject needs further investigation, but it begins to look very much as though it was due to drought more than anything else, for it has been noted to be most prevalent in seasons when there was a shortage of rainfall, and has been much more troublesome on dry sandy soils north of Miami than on the clay soils around Homestead and Larkin. Is it not probable that the browning of avocado leaves which is so common here in California may be due to the same cause? Perhaps it is the dryness of the atmosphere rather than of the soil which usually affects the trees here, since they are ordinarily well irrigated and the soil is retentive of moisture.

In most of the Florida groves the trees are planted about 24 by 24 feet. Sometimes this

distance is decreased to 20 feet, so that the trees will shade the ground sooner; sometimes it is increased to 26 feet, so as to allow more room for ultimate development. They undoubtedly require more room on heavy soils than on light, and for this reason it will doubtless be necessary to plant at greater distances here in California. Experience has shown that the young trees should be kept heavily mulched; weeds, grass, palm leaves and seaweed are used for this purpose. During the winter season the mulch is sometimes removed, and the surface given very shallow cultivation; on the approach of summer the mulch is replaced, and cow peas or velvet beans are often planted between the rows. A mulch should be kept around the tree until it is at least 3 or 4 years old, when the shade of its foliage and the accumulation of fallen leaves upon the ground may serve as sufficient protection from the sun.

There is no established practice in regard to fertilizing avocados, each grower having his own ideas on the subject, as a rule. Opinions generally agree, however, that nitrogen should be from an organic source, and blood and bone is one of the favorite fertilizers. The first year after the grove is planted five or six pounds are usually given to each tree, in five or six applications during the year. During the second year the amount may well be increased to 12 pounds per tree, and the third year to 24 pounds per tree. In the old Bliss grove, now in its eleventh year, each tree receives approximately 50 pounds per year, in four applications. The last application in the fall is given about the end of November; no more fertilizer is then applied until after the fruit has formed in the spring.

Some of you may know S. B. Bliss, who planted the Bliss grove. He spends part of his time here in California and is almost as much of a Californian as he is a Floridian. He had the foresight to start out in an early day, when the planting of budded avocados was looked upon as a rather precarious undertaking, and plant an orchard of nearly twenty acres. The first few years were not without their problems, but the enterprise survived all vicissitudes and is today paying handsome returns. We have no \$30,000 trees in Florida, such as the newspapers report here in California, but a property like the Bliss grove, if it continues to pay as well as it has the past two years, should liberate a man from financial worries.

Probably you would be interested to learn some of the actual returns from these Florida groves. I have it from an authoritative source that the average return from one large grove, which shipped over 1400 crates of Trapps during the fall of 1914, was \$5.50 per crate net. In another grove the entire crop was marketed at a net price of \$5.25 per crate. In this grove the trees produced an average of one and one-half crates of fruit, and there were 70 trees to the acre; the net profit was, therefore, \$550 per acre. The yield per tree seems low, and has, I believe, been exceeded in several other instances. W. J. Krome of Homestead, who grows Trapps extensively and who has kept careful crop records, tells me that a tree should yield four crates of fruit at five years of age. This has been a fair average for his trees; some of them have fallen as low as 2 or 3 crates, while the average of 4 has been considerably exceeded in other instances. Mr. Cellon says some of his Trapps, which are now 8 or 10 years old, produce from 6 to 10 crates. The average pack is 40 fruits per crate, the extremes being about 23 and 54. At the beginning of the season, i. e., in October, Trapps bring about \$2 per crate. By Thanksgiving the price is considerably higher and from that time until after Christmas it

is excellent. The last few crates from one grove the past season brought \$36 per crate of 36 fruits; this was in early February.

Trapps have been shipped without difficulty to all parts of the United States. The past season one grower sent small consignments—a crate or two—every day during a large part of the shipping season to Seattle, Wash., and told me he did not receive a single complaint of a crate being received in bad order. These shipments were on the road eight days, and were not sent in cold storage. I do not know of any instances in which avocados have been shipped from Florida in cold storage. The usual method is to ship by express.

At the present time most of the crop goes to the markets of the eastern United States—Washington, Philadelphia, New York and Boston each taking a good share. There seems to be quite a demand in the Middle West, however, and I understand a good many shipments are made to Chicago, St. Louis, Cincinnati and even as far west as Denver.

The shipping qualities of Trapp are much better than the average seedling. One grower told me that last year he received a report of several cases of Trapps being received in bad order in one of the northern cities; he thought it peculiar, and upon investigation found that his man had put in a number of seedling fruits which looked like Trapps, and it was these that had spoiled in transit. Some attention should be given to this subject here in California, though it may not be of such great importance with the Guatemalan type as it is with the South American.

Best results in picking avocados have been obtained when orange clippers were used. The stem is usually swollen just above the point of attachment with the fruit, and it is severed with the clippers just above this swollen portion. Seedlings are sometimes picked before they are fully ripe, a thing which should not be encouraged, for these fruits, when they soften up and are sold in northern cities, are certain to be flat and tasteless, and if they should fall into the hands of those who were trying the avocado for the first time they would give a very bad impression. Trapps are left on the tree as long as possible; when they begin to change from bright green to yellowish green they must be picked or they will drop. Sometimes they are picked only a day or two before they would drop, and in such cases they are certain to ripen up in transit and reach the market in an over-ripe condition. To prevent this Mr. Cellon tells me it is his custom to lay aside any doubtful fruits as soon as picked and leave them 24 hours; if at the end of this time they are still firm he concludes that they will stand shipment.

The standard package for avocados in Florida is the tomato crate, which measures about 12x12x24 inches. It is sometimes used with a partition in the center, sometimes without. Excelsior is used above and below each layer of fruits as a cushion. Some growers wrap each fruit in tissue paper, but it is coming to be generally believed that it is better not to wrap them at all. The fruits seem to heat more quickly when wrapped, and as heating greatly hastens the ripening process it must be avoided as much as possible.

Now as to varieties and types. Trapp is the only one which is at all extensively grown, as has already been mentioned. There are several others, however, which deserve a word or two. Trapp commences to ripen in late September, at the time when most varieties are just about going out of season. Many of the fruits must be picked in

October or November or they will drop. A few hang on until New Year's, and an occasional one until February. Several other varieties have appeared in Florida which show the same tendency to carry their fruits very late, but as yet none of these has assumed any prominence. I believe we may obtain a seedling one of these days, however, which may prove to be just as late as Trapp, of fully as good or better quality, with a smaller seed, and of a stronger constitution. We will probably have to depend upon the South American type to furnish varieties for fall and early winter, after which the Guatemalan type will hold sway. Pollock ranks next in importance to Trapp, yet the total number of trees grown in the vicinity of Miami is small. It is a magnificent fruit; large, attractive and of as good quality as any Florida avocado I have eaten. Though it ripens in late summer, Mr. Cellon has found that it sells well in northern markets, bringing a sufficiently higher price than seedling fruits to more than offset the small crop which it produces. It shows a strong tendency to fruit in alternate years, and never bears very heavily. The tree is a strong grower and suffers less from die-back than Trapp.

Beyond Trapp and Pollock there are no varieties cultivated on a commercial scale. Quite a number of good avocados have appeared within the past 10 years, and some of them have been propagated to a limited extent, but the demand has been for a fruit which would ripen late, and Trapp has been the only one to meet this demand. One who wants a good summer fruit, however, can choose between a number of good varieties, smaller than Pollock, but more prolific. Wester is one of the best of these, but it is a maroon-colored fruit, and there is strong prejudice among some of the growers against reddish or purple fruits, if they are to be marketed. Mr. Cellon has persistently affirmed that a purple avocado would not go in northern markets, and he will not give serious consideration to a variety of this color. Cardinal is another good summer fruit, of an attractive bright crimson-red color. Family has been propagated to a certain extent, more at Palm Beach than at Miami, I believe. It commences to ripen early but carries some fruits well toward the end of the season. It is prolific, but is generally considered to be very much below the standard in quality.

The question is often asked: Which section grows the best avocados, Florida or California? No doubt the reply to this is largely a matter of personal preference; to some palates the South American type may be preferable, to others one of the types grown in California. I do not believe the question can be answered in few words. Personally, I do not consider the South American seedlings, grown in Florida and Cuba, nearly as good, on the average, as the Guatemalan seedlings grown in California. A fruit such as Pollock, however, certainly puts a somewhat different aspect on the thing. Comparing the South American and Guatemalan types, one finds that the latter is characterized by a slightly richer, more nutty flavor, on the whole, and I prefer it to any other. I had an opportunity to test it under favorable conditions at Miami last spring, and I believe that the best California varieties, such as Taft and Blakeman, will be of just as good quality when grown in Florida as they are here in California. This question has sometimes been argued on a rather unsound basis, I think; it is not so much a question of whether the South American type is as good as the Guatemalan type, as it is a question of whether Florida will produce as good fruits of a given variety as California. Of course, the same variety when grown under widely different conditions will often exhibit slight differences of texture, color or flavor, but I do not believe that the difference between Florida grown and California grown avocados of the Guatemalan type are going to be great enough to

merit attention.

Questions on the subject matter of the above paper elicited the following from Mr. Popenoe: That the Trapp bears heavily in Florida, and that they prune very little. The trees are stocky and dwarfed in stature,—a ten year old tree there being no larger than a five year old tree in California,—and it is customary to plant about seventy trees to the acre. Practically no irrigation is used.

On being questioned about it, Mr. Popenoe produced a Trapp fruit which he described as having a thick leathery skin, not hard like the thick skins of California, but pliable, yellowish green in color when ripe, smooth meat of good flavor, but with a comparatively large seed which is loose in the cavity in about one-half of the fruits. The tree blooms from November to March, and fruit is marketed in summer.

As to experiences of the Florida growers, he thinks they will be of little value to the California growers, on account of the difference in soil and climatic conditions. Their trees are often grown on soil only one foot in depth. The young trees will stand a temperature of 30 to 32 degrees, older ones about 28 without being hurt.

Supply and Demand

Queries brought out the fact that the supply of good fruit never equaled the demand. In the Trapp season there has by no means been an excessive supply, and at present they are the greatest source of commercial fruit. California has an open field in the eastern markets from January to July when Florida Trapps are not in competition, but the latter state may come in later with a Guatemalan variety.

The avocado is produced now the whole year round, but Mr. Popenoe could think of no hard shelled fruit ripening in California in January or February.

A gentleman of the audience stated that he knew of a hard shell variety that ripens in January, and discussion brought out the fact that this was the Spinks fruit, a specimen of which weighed 37½ ounces, and was grown by Mr. Wm. A. Spinks at Duarte.

On further questioning Mr. Popenoe stated that he felt that the best soil was a rich, sandy loam, although in Florida he found that trees do better on the heavier soil. In Cuba, where he had seen some very good groves, they have a great deal of red clay.

President Hart adjourned the meeting a little before noon, in order to give the audience an opportunity to see the exhibits of fruit and trees, and sample the various dishes of avocado that had been prepared in different forms. Adjourned to 1:45 p.m.