Patillo, and Blitch have been sent to tropical areas, generally as seeds rather than clonal material however. These along with heavy fruiting, large sized sweet varieties such as the Redland, and Ruby Supreme hybrids have provided superior material for orchards in Venezuela, Central America, the West Indies and other areas.

Other Fruits

Many additional species of fruits are grown in Florida and superior varieties among them have been selected and propagated. Among these fruits mention should be made of the carambola, star apple, Barbados cherry or acerola, white sapote, black sapote, atemoya, lychee, longan, peach. Perhaps over a hundred other species of fruits are grown but most of them have not generated new superior varieties of potential value in other areas. More intensive cultivation of these fruits may so do in the future, however.

Nearly fifteen years ago an organization was established in South Florida to promote the introduction and selection of superior varieties of tropical fruits by private individuals. This organization is called the Rare Fruit Council of South Florida and is actively interested in trading clonal material of superior fruits with anyone in the tropics. Several of the members have fine personal collections with more than fifty species or varieties of the less common fruits. Among those that have had such collections for several years are Mr. B. Bowker, Mr. Ed. Joon, Mrs. Robert A. Martin, Mr. W. F. Whitman and Mr. Seymore Younghans. These collections include the fruits listed above and many more.

One additional collection needs to be mentioned. This is the collection of Mrs. E. C. Sweeney of Coconut Grove. Mrs. Sweeney purchased the estate of Dr. David Fairchild several years ago and has maintained his personal collection of fruit trees. In addition she has added many new varieties and species making her collection one of the outstanding ones in the state.

Her collection contains many old citrus varieties as well as unusual mangos, avocados and other fruits. Much credit is due to Mrs. Sweeney and the many other private collectors of tropical fruits in Florida for maintaining and improving a valuable germ plasm bank of clonal material of tropical fruits and making it available to other tropical regions where it can be of great value.

THE VALUE OF SYSTEMATIC POMOLOGY IN TROPICAL FRUIT CULTURE

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We should be giving the grower, present and prospective, more complete information about fruit varieties, or cultivars as you call them today. Because this symposium is oriented toward tropical America, I am thinking particularly of horticulturists in that part of the world, but the statement really holds good everywhere.

The placing on record of well-organized information about a fruit variety is systematic pomology. This must include history as far as it is available; nomenclature and classification; and finally the principal characteristics of the tree and of the fruit itself.

History

Oftentimes knowledge of the background of a variety is of immense value in breeding work, or in forecasting climatic adaptations, or of probable productiveness and other potentialities. Perhaps I can engage your attention by reciting what we know about the history of that important avocado, Lula.

One day, back about 1923, I sat beside George B. Cellon in front of his roll-top desk in the old stone house which he had built in the very outskirts of Miami — two miles north of Flagler street. I asked him about the origin of Lula. He said he had eaten an avocado, which I feel sure he said was a Taft, and thrown the seed in the gigantic spittoon which stood beside his desk. His wife fished it out, and planted it near the house. It fruited in 1919. He thought it

good, named it for his wife, and put it on the market as a new variety.

I cannot remember whether he said the Taft fruit was from a budded tree he had received from my father's nursery in California, or whether the fruit had been sent him from C. P. Taft's place. I should have covered this point in my field book. I failed to do so, which shows I was not much of a systematic pomologist.

In the minds of some horticulturists there exists this question: Is Lula a pure Guatemalan, or is it a hybrid? Cellon had in his grove trees of both races. If the fruit came from California, it is pure Guatemalan, for if there were any West Indian avocados at that time, they were almost certainly in Joseph Sexton's place at Goleta, north of Santa Barbara. While it has been shown conclusively that bees are very effective agents in transferring avocado pollen from one tree to another, I doubt that even a California bee could fly from Santa Barbara to an orchard thirty miles south of Los Angeles.

Let us consider mango history for a moment. Among present day commercial varieties, I am told there is none of which we know both parents. The pistillate parent is the only one we are sure about. Even so, we have something. If the pistillate parent was Sandersha, for example, we have reason to hope that the new variety may give us some fruit every year, for Sandersha has a good reputation as a consistent bearer.

In that excellent paper on mango varieties published by S. J. Lynch and Mrs. W. J. Krome in the Proceedings of the Florida Mango Forum, they tell us that "Irwin comes from a Lippens seed" and in another place, "Lippens is a seedling of Haden." Everybody knows that Haden is a seedling of Mulgoba. Three generations of mango history. Pretty good.

Nomenclature

This is not yet much of a problem in Florida, commercially speaking, but it is beginning to bother us in tropical America, where names so often get changed due to loss of labels or for other less pardonable reasons. In defense of my Latin American friends, let us see what L. B. Singh of Saharanpur says about the situation in the home of the mango. "The nomenclature of the mango varieties in India is most confusing. The general craze with some nurserymen and orchardists for having the largest number of varieties in their collection has led to every variable seedling being named as a 'variety', usually with the name of family members or relatives or patrons. Not content with this, they may also coin several names for the same strain of a particular seedling. — Even one particular variety has been given different names in different catalogs."

During the early years of this century, when David Fairchild was actively introducing mangos from India through the U. S. Department of Agriculture, we ran up against this problem. In Florida we have an Amini from India. Glancing through the mango literature of that great country, you will find several Aminis which do not answer the description of ours.

As we proceed with the development of tropical fruit culture, we should devote attention to nomenclature. This may be a tougher problem in tropical America than it has been, to date, in Florida. The prospective planter needs protection, and I don't see where he can depend on getting it unless it is through the books and bulletins written by professional horticulturists.

Classification

Here is where systematic pomology can give us the most help. As everyone knows, early writers classified avocados as "round green, pear-shaped green, round purple, pear-shaped purple," and so on. Such a classification, which is termed by pomologists *artificial*, doesn't get you very far. Somewhat more useful, commercially speaking, is a classification based on season — early, mid-season, or late. But this doesn't get you very far either, except in connection with marketing, or in some cases, climatic adaptations.

U. P. Hedrick put the matter this way: "As far as possible, systematic pomology is a classification of fruits according to their natural relationships." I am sure the Dean of American Horticulturists, H. B. Tukey, will back me up when I say that this sort of classification should be our objective, first, last and all the time. Let us consider an example of what it can do for us.

Many years ago we found that there are three horticultural races of avocados, based on natural characteristics. We don't need to be reminded how useful this classification has proved. Climatic adaptations, annual versus the tendency

to alternate bearing, season of ripening, commercial characteristics of the fruit — these and other features are of great horticultural importance. In recent times hybrids have come upon the stage, and here is where History — the racial background of a variety — helps us. No one disagrees with this, but it seems that some folks don't like to call this sort of knowledge systematic pomology.

What about the mango? The fact that this delicious fruit, the apple of the tropics, has been cultivated so long and so widely has up to now prevented us from achieving a comprehensive natural classification based on races and groups. A little progress has been made, especially in Florida, in the West Indies, in Hawaii and more recently in India. But we still have far to go.

Description

Accurate description of a variety, including characteristics of the tree and of the fruit itself, provides the key to a natural classification. Another use of complete and accurate descriptions has been brought home vividly to me in recent years. I have been trying to help horticulturists in tropical America find out just what we have on hand, for guidance in connection with the development of Temperate Zone fruit culture. In some remote spot we find an apple, or a pear, or a plum which we think is worth propagating. What is the variety? In trying to identify it, we have been helped by such works as S. A. Beach, "The Apples of New York", and by that magnificent series of monographs put out by Hedrick and his associates at the New York State Experiment Station.

When it comes to tropical fruits, we have scanty literature with which to work. The classic examples of good pomological descriptions of avocados and mangos are those published by that master, William A. Taylor, in the Yearbooks of the U. S. Department of Agriculture. These were published about 60 years ago.

Perhaps it will be useful to discuss the major points we must treat in connection with avocados. In this connection I would like to mention the avocado descriptions which have been published in Brazil by that excellent horticulturist Heitor Montenegro. They are about the most complete which have come to my attention.

We begin with the *tree*, its form, branching habit, and productiveness. How I wish we could always include yields, based on ten trees, let us say, over a period of ten years. Of course this would give a black eye to some of my pet Guatemalan varieties, for example Nabal. Some years ago, in addressing the California Avocado Society, I mentioned that I had used the name Nabal because it means, in the Kekchi language, "abundant, plentiful". I had to add in a whisper "every three years!"

Then we describe the *leaves*, their approximate size and form, their texture and something about the color, which may give us a clue to the racial background. And don't forget the anise odor. When we run up against an unknown variety, the first thing all of us do is to crush in one hand a leaf or two, sniff sniff, and then stand back and with a serious professional look on our faces, somewhat like that of Sir Oracle, remark: "It is doubtless a hybrid. It has some Mexican blood. Perhaps 25%."

The character of the inflorescence deserves a note, of course — perhaps not so much detail as in the case of a mango variety, where it may be of major importance in connection with classification in a recognized race or group.

Then we start with the *fruit* itself. First the length and character of the *stem*, a racial characteristic. Then the *form*, commonly somewhat variable. On course there is considerable range in *size*, that is, length and breadth of the fruit, and I hope our tropical American friends, when they translate our descriptions and use the metric system, won't split hairs and say that a fruit which we call 5 inches long is 12 and 6/10 centimeters. As regards *weight*, we put down the maximum and minimum, and the horticulturist who has an orchard in tropical America had better be careful about counting on 40-ounce Pollocks. In the tropics I have never seen Pollocks attain the size they reach in south Dade. I wonder why? I cannot believe it is the soil, for we have lots of good soil in tropical America. Is it fertilizer? Many of my tropical friends think so, because they have heard what H. J. Webber said, after he had worked for years in Florida, then moved to California: "Those Florida soils are 95% sand and the rest pure silica." Of course, he was not talking about south Dade.

After form and size we go on to a description of the *surface* of the fruit, a characteristic which I suspect is sometimes influenced by the environment. Hass is sometimes so warty in

the tropical American highlands that we could not sell it on a discriminating market. In southern Spain it is a slightly rough, beautiful little fruit. They ship it to Madrid and get the equivalent of a dollar a kilo. We describe the *color* and then the thickness and texture of the *skin*. Many Mexican avocados have skins no thicker than that of an apple, while some of the Guatemalans have skins so thick and woody that people who still talk about "alligator pears" call them "hard shelled". Consumers have complained that it is difficult for them to tell when such fruits are ready for eating. Pressure with the thumb does no good, nor harm. Remember the story of the Italian who had a little fruit stand in lower New York, and put up a sign "If you muss pincha da fruit, pincha da coconut"?

Then comes the *flesh*, its texture and color, which as we all know may vary from pale cream to rich yellow. Here again, queer things happen. I can not forget that some of the avocados I saw in the Rio Grande valley of Texas had flesh of much deeper yellow color than the same varieties as I recalled them in Florida and California. We'd better talk to William C. Cooper about this.

Finally, we come up against the most difficult problems of all, *flavor* and *quality*. Those two are often confused. Talking about good flavor and rich quality is enough to make an old-school pomologist turn over in his grave. Flavor can be rich, bland, nutty and so on. In tropical America my friends may say a certain avocado is sweetish. The Brazilians go further; they put sugar on their avocados. A favorite dish is avocados well sweetened, beaten up with crushed ice. They have a little joke they spring on foreigners: "What is the sweetest fruit in the world?" Answer, "An avocado with plenty of sugar." Turning now to quality, it can be fair, or good, or very good, or excellent. Sometimes it is called "best".

Both as regards flavor and quality I am afraid we shall never eliminate personal opinion altogether. To make the problem even more difficult, the place where the fruit was grown, the degree of maturity, and I suspect other factors come into play. There does not seem to be a high positive correlation between high fat content and flavor. I know plenty of people right here in Dade county who prefer a Pollock with 5% oil to any one of the Guatemalans with 15% oil (you know we do not say "fat content" any more).

After having struggled with flavor and quality, realizing that in both features not everybody is going to agree with us, the *seed* must come in for attention. First its *shape* and *size*. Avocado seeds are usually termed small, medium sized, or large, which seems adequate except in those instances where a nurseryman is putting a new variety on the market. The surface of the cotyledons is smooth or rough; the seed coats sometimes coherent, sometimes separate, the outer one adhering to the wall of the seed cavity. (How often have my friends in the tropical American lowlands told me you know when an avocado is mature; you shake it and the seed rattles in the cavity!) The *oil content* of the fruit should always be stated, based upon as many analyses of mature fruits as possible. Due to different degrees of maturity and perhaps other factors, we often have, for a given variety, a wide range in oil content.

Finally, the *season* of *ripening*, which does not include those periods during which a grower ships immature fruit to get ahead of the other fellow. I have been impressed by the fact that some varieties mature over a much longer period than others. In 1968 I picked the first fruits from my old Fuerte tree — and they were mature enough — on the 4th of July and the last ones on Thanksgiving Day.

George Ruehle, in that excellent bulletin 602, "The Florida Avocado Industry", ends his descriptions (which on the whole are very satisfactory) with some highly useful notes such as these regarding Lula: "Both foliage and fruit are highly susceptible to scab, but this can be controlled by timely applications of fungicides, if trees are spaced far enough apart to permit effective spray coverage. The fruit has the tendency to sunburn if held on the tree late in the season. The variety has proved satisfactory both in the ridge section and on the lower East Coast, in spite of its susceptibility to disease and its tall habit of growth. The fruit can be refrigerated successfully." Such observations are of interest to everyone, whether he lives in Florida or in Chile or in Israel or in South Africa.

It would be presumptuous for me to tell you how to describe a mango variety. Just go down to Homestead and talk to Mrs. Krome. She has the history of all varieties grown in Florida at her fingertips. And she has had

mangos under close observation for years. I particularly recommend that you get her evaluation of flavor and quality. She does not have a large grove of any variety, therefore she is free from commercial bias. And she is honest enough to name the varieties which are not really good mangos, but which are money makers. That's what the potential grower wants to know. Maybe the moneymakers of today won't be the profitable varieties of tomorrow. Then we will top-work them.

In Conclusion

And now, I hope I have convinced those of you who need convincing, that systematic pomology is not an academic subject, though text books have been written about it. Systematic pomology is nothing more nor less than an indispensable tool which should be in the hands of every horticulturist who is working with tropical fruits. You do not need to call yourself a systematic pomologist. This, you think, would put you back in the horse and buggy days of horticultural science.

FLORIDA'S PAST AND POTENTIAL CONTRIBUTION TO THE CHANGING NEEDS OF LATIN AMERICAN HORTICULTURE

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Florida is associated with the subtropics in the minds of many people in the United States, and to Latin America Florida represents a place where tropical agriculture may be studied. Over the past 25 years a good number of our leaders in agriculture have studied in Florida. Many Floridians have provided technical assistance to the tropics through contracts or on a personal basis, taking part in scientific meetings or actively supporting professional groups such as the Tropical Region of the ASHS. The fast pace at which Latin America is growing and developing poses to Florida the need to adapt to the changing needs, if it is to retain this position of leadership. A number of other states are also establishing programs to study tropical agricultural problems. The field of "international cooperation" is crowded. To keep this position of a "door to the tropics" and that of a Center for specialized training, Florida must find ways of strengthening this favored position.

Three ways in which Florida can advance towards this end are the following: (a) Aiding worthy vocational schools; (b) Widening Multi-institutional programs with advanced centers in Latin America; (c) Strengthening partnership in development studies.

[1]The opinions expressed are those of the author and not necessarily of the Institution.

Horticulture at the intermediate level

Recent recognition has been given to the urgency of paying more attention to the training at the vocational level, among several needs, by a group of Latin American leaders meeting recently in Costa Rica (1). The University of Florida has recognized for some time the importance of the intermediate level, and over a period of 15 years it will have granted degrees to a total of 137 superior students from the Escuela Agrícola Panamericana[2]. The fact that Florida enabled these students to meet the requirements for degrees and go on to positions of responsibility in research, teaching and private enterprise, has given wide recognition to this State. The Escuela Agrícola Panamericana, by its own high admission standards and fine training program, also made it possible for this 12% of the total of 1113 graduates to acquire greater skills and profficiency. As Robert P. Armour* expresses it, "this is an impressive figure" for a vocational school. Of the higher degrees earned, 10 are at the Ph.D. level, 27 are Master's degrees and 100 are B.S. degrees. This indicates that we still have in Tropical America an untouched potential of young men who can assume positions of leadership when given the opportunity. This kind of recognition, pioneered by Florida, points the way to strengthening other

[2]Personal communication from Robert P. Armour, Director, Escuela Agricola Panamericana, Honduras. October 9, 1969. Data includes 1968-69 candidates.