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Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

[1965]

GUEST ADDRESS
IMPROVING THE SUBSISTENCE AGRICULTURE
OF THE HIGHLANDS MAYA

Wilson Popenoe 1/

The title of this talk could as well have been "Improving the Corn Culture of the Highlands Maya," since he subsists largely on corn products. Good accounts are available on the history and uses of corn by the Maya 2, 3, 4, 5/. It is generally believed that the Maya were able to establish a great civilization because they had a good staple crop -- corn. The calendar he developed probably between 300-900 A.D. is more nearly correct than the one we use today. Although his pyramids and temples at Tikal and Copan lay in ruin, his descendants have moved into the mountains and corn continues to be king. Near Huehuetanango, about the size of New Jersey, are more than 80 varieties grown. This does not signify that these are all native to that department. It is not uncommon for the "Indígenas" of Guatemala to sell his corn crop immediately after harvest, and as far as 100 miles from where it was produced. Then, the farmer must buy corn for tortillas for his own family at a local market, to which corn has been brought from another micro-climate of Guatemala. He might well have saved for seed grain from the purchased corn, rather than from that which he grew.

1/ Director Emeritus, Escuela Agrícola Panamericana, Tegucigalpa, Honduras. Residence: Casa Oider, Calle de la Nobleza 2, Antigua, Guatemala, C. A.

2/ Wellhausen, E. J., A. Fuentes O., A. H. Corzo, and P. C. Mangelsdorf. Races of Maize in Central America. Nat. Acad. Sci.-Nat. Res. Coun. Pub. 511. Washington, D. C. 1957.

3/ Mangelsdorf, P. C. and R. G. Reeves. The Origin of Indian Corn and its Relatives. Texas Agr. Exp. Sta. Bul. 574 (Monograph). 1939.

4/ Weatherwax, Paul. Indian Corn in Old America. Macmillan Co., N. Y. 1954.

5/

Melhus 5/ et al stated that their studies showed that adjacent fields less than 500 feet apart had different climates, brought about by altitudes, exposure, rainfall, light intensity, and temperature. It would not surprise me that corn growing from the base of a large mountain in Guatemala to the top and down the other side is subjected to greater climatic diversity than is found throughout the entire corn-growing area of the North American Continent on a given day during the season for growing corn.

Corn is not something here that is grown to store in bins, sell to the government, play on the Chicago market, nor feed to livestock. It is a much more personal thing, a part of the Indian's everyday existence, his main staple of diet. It is evident in his art, sculpture, weaving, and even his religion. Few seeds are planted that have not been taken to a temple or church to have a divine blessing placed on them before they are committed to the soil. H. M. Sierra 5/ stated that "The Indians consider it an indispensable part of their existence to cultivate corn with their own hands, to the extent that even if they were given the amount of corn necessary for their tortillas or pancakes, they would still plant corn according to their own traditions, which are intimately related to their religion ..... the Guatemala Indian does not even bother about where or how he plants his corn; his chief object being to have corn planted that he can take care of as tenderly as a father takes care of his children. He does not calculate costs such as those of clearing and preparing the land, cultivating, how long it takes to reach his field nor how difficult it is. When he has obtained his crop, he does not even stop to think about the 30 or 40 miles he has to walk with 2 bushels on his back to reach the

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5/ Melhus, I. E. Editor. Plant Research in the Tropics. Iowa Agr. Exp. Sta. Bul. 371: 497-660. 1949.

market. Once there, he just sits and waits, no matter how long, until someone buys his corn. If the same system were used in the United States, corn would have to bring $70.00 a bushel; yet the actual cost of a bushel of corn in Guatemala is $1.25 - less than one-half of what it is in the United States ..... We see that the objective of his struggle is his own happiness and that of his children. The Indian is rooted to the soil on which he lives, whether nature is kind or wild or unruly. To destroy or disorganize brusquely his way of life is impossible. The Indian is happy when he grows corn."

This afternoon Hugh showed you the system of shifting cultivation used in Guatemalan corn culture, and its details are outlined elsewhere in these Proceedings. The tools and methods are essentially the same as those in use for the past 3000 years. Varieties are all open-pollinated and are classified according to color, maturity, and texture of the endosperm. The combinations of yellow, white, and purple; early and late; and flinty or floury endosperm predominate. Prejudice for endosperm color is strong. The Maya prefer yellow, while their neighbors in Mexico and El Salvador prefer white endosperm corn. Production averages about 10-15 bushels per acre, just as it has for the past 2000-3000 years. The task will not be easy. It may take years to get the Indians to make a change. I have been in and out of Guatemala for almost 50 years, and am fully convinced that although the Guatemalan Indian enjoys more liberty today than in times past, his economic lot is not greatly different from what it was in pre-Columbian times. Western civilization has given him a steel hoe, which is about the only improvement it can claim in spite of billions of dollars spent in Latin America by the United States. So far, most of the effort by governmental and philanthropic organizations to improve agriculture has been limited to the big farms.

Only a few of the Indians can read or write, and most of them not only are suspicious of outsiders, but also of white Guatemalans. Oppression suffered at the hands of the Spanish has not been completely forgotten. Now, what can we do to help the Indian wrest more food from the reluctant soil? This question is not intended to infer that nothing has been done to date. Programs are underway at the present time. In the Ministry of Agriculture of Guatemala, the Instituto Agropecuario Nacional (IAN) has an experiment station system with departments much like that of Florida, but on a smaller scale. It is called the Division de Investigaciones Agropecuarias. It has sections of Agronomy, Biometry, Entomology, Plant Pathology, Fruit Culture, Kenaf, Meteorology, Editorial, Agricultural Chemistry, and Soils in Guatemala City. The 5 sub-stations are located in Barcena, Cuyuta, Chimaltenango, Chocola, and Labor Ovalle. Cooperative agreements are in effect with the IAN and US-AID, PCCMCA (Rockefeller Foundation), FAO-UN, FAS-USDA, etc.

The Guatemalan Indian Service (SFEI) also has a program, and with that of the Agricultural Extension Service, have agents located strategically in the highlands. Complementing these services are the agricultural missionaries, notably the Maryknoll Fathers. All these programs are faced with the universal problem of scarcity of funds, facilities and staff members.

The groundwork has been laid. Germplasm collections have been made and catalogued of the races and sub-races of the corns growing in the highlands by Dr. F. W. McBryde in 1940-41, Dr. Edgar Anderson in 1946, and the National Research Council - Rockefeller Foundation in 1952-53 2/. Variety crossing, fertilization, and pest control studies are underway with the agencies listed above cooperating.

2/ Op. cit.

I became actively engaged in the program in early 1964 when a tripartite meeting was held at my home in Antigua. Vice-president Henry A. Wallace of the U.S.A., Don Francisco de Sola, President of the Board of Trustees of the E.A.P. at Zamorano; and I got together to discuss ways and means of speeding help to the Indians in their corn culture. Prof. Albert S. Muller, recently Foreign Student Advisor at the University of Florida, and now Director of the School at Zamorano, and Dr. George Freytag, its Agronomy Department Head, met with us to draw up plans for the project.

Mr. Wallace's impression of the problem was recorded in Spanish in La Hacienda Magazine 6/ for October 1964, pp. 48-49, from a letter he wrote Bob Cody, as follows:

"On my trip to the Tierra Fria of Guatemala, where the Indians derive such a high percentage of their livelihood from corn, I was accompanied by Leopoldo Sandoval and Jorge Castillo, both of the Guatemalan SFEI, or Indian Service.

We first went to Huehuetenango to visit the Maryknoll Fathers who have a excellent corn program among the Indians: they put out to the individual Indians a package deal of a small amount of seed corn (sintetico, not hybrid), a small quantity of fertilizer and some aldrin to kill the grub known as the "gallina ciega."

This combination gives a yield perhaps three times what the Indians get on their adjoining land. Brother Felix -- who used to bag, detassel, cross-breed and in-breed corn for a corn breeder in Pennsylvania, has charge of this work in cooperation with Brother Carl.

From the very start, Brother Felix felt it would be better for the Indians to use either an improved variety of a combination of eight or more in-bred sorts,

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6/ La Hacienda Magazine, Mr. Robert S. Cody, Editor, Drawer 871, Kissimmee, Florida, 32741. Used with permission.

or a cross of varieties, rather than hybrid corn. (Even if it would pay them to do so, the Indians would prefer to save their own seed.)

There is every indication, however, that fertilizer applications will be going up very rapidly. At the moment the yield of corn in the high country averages only about 10 bushels per acre. With proper application of fertilizer and insecticide the yield can easily be trebled. Sandoval, Castillo and the Maryknoll Fathers all seem to be in agreement on this point.

The improved varieties are also important, but at the start perhaps not so important as fertilizer and insecticides. I did not find much if any evidence of "stunt" disease or "achaparramiento" in the Highlands.

Amazingly, many of the Indians are aware that yellow corn has a vitamin which is lacking in white corn. (The wealthier people in the towns do not seem to be so aware!)

The Indians put 200 to 400 hours of hand labor on an acre of corn. They put 7-10 kernels in a hill, and put the hills about 3 feet or a little more apart each way. I would guess that it takes at least 100 times as many minutes to produce a bushel of corn on a highland Indian farm as on an Iowa farm. But the Indian does not have to pay out anything for tractor repairs or gas or oil, and he maintains for the most part the same way of life as served his fathers for 3000 years.

But, undoubtedly, on the Pacific Coastal plain--properly cleared and ditched--it would be possible to produce a bushel of corn almost as cheaply, and perhaps more cheaply, than in my home state of Iowa. But for my part, the most important step to take right now in Guatemala is to help the Highland Indians in the same way as the Maryknoll Fathers are helping, and I believe the Quakers and the Presbyterians have in mind this same kind of work.

The Pacific Coastal plain can grow 3 crops a year with proper fertilization and proper attention to the control of the sub-surface irrigation. Here tractors and modern spray equipment can be used. Here the temperature is high enough for corn the year around while in the highlands there are frosts during the months of our winter. There is a long dry spell over the country from November until the first of May. From May till the first of October there is lots of rain, but there may be a damaging dry spell for 3 weeks or so during late July and August. To escape this dry spell some of the Indians plant in February using their planting stick called a macana to put in the kernels as deep as 8 or 9 inches, if necessary to reach moist soil. In early March I dug up some of this early planted corn and found the distance between the kernel and the first leaf to be as much as 9 inches. Of course, our own Hopi Indians in Arizona plant this deep as a matter of regular course in their fields at the base of a mountain slope.

One very time-consuming operation in which most of the corn growing Indians engage is "doblar" or doubling, that is doubling the stalk just below the ear a week or so before the corn gets fully ripe. The chief object is to prevent bird damage. The second object is to prevent water damaging the corn. Most of the Indians can only store a part of their corn and so the rest must be left in the field until they need it to make tortillas. The Indians used to consume a pound and a half of corn per person a day. Now it seems they require only about a pound per person per day. If cheap and adequate drying and storing facilities could be arranged for the Indian on his own farm, it would be a great blessing. Many Indians sell surplus corn on a low market and at other times buy on a high market. It would be a blessing if kinds of corn could be found which would stand up against the wind and rain without the time consuming "hilling up" or "aporque." Dr. Manlio Castillo may perhaps have found such a corn.

Many people say, "The Guatemalan corn problem is simple. Let all the corn be grown on the level coastal plains and let the Indians work on the coffee fincas or engage in weaving or other industrial pursuits or perhaps develop a big fruit and vegetable growing industry." However, it happens that corn has to compete with sugar and a number of other crops for the level land. Moreover, those who love the Indians do not like to see his ancient way of life so gravely disturbed. These people are willing to go all out to treble the yield of corn on the mountain valleys and slopes which are not too steep. Technically, they know it is possible to get 80 bushels of corn per acre on some of these mountain valleys with proper fertilizers, insecticides and varieties. In any event the varieties used in the mountains will be totally different from those used in the coastal plains. In both cases the preferred corn is usually quite flinty with the white corn more favored at the lower altitudes.

Some day corn breeders and proper storage will help the Indians to avoid "aporque" and "doblar." This will save many, many days of labor per acre. With this release of labor perhaps more of certain appropriate textile and wood working industries can be brought into the Tierra Fria where 80 per cent of the population is Indian and where the population increases nearly 3 per cent annually in spite of sickness and mal-nutrition."

Talks continued through the course of the Cooperative Central American Project for the Improvement of Subsistence Crops (PCCMCA) sponsored by the Rockefeller Foundation that were being held in the Hotel Antigua during March 1-4, 1964.

Because of the proximity of the planting season in 1964, most of the work this year has consisted of fertilizer tests and demonstration plantings by Dr. Milton Lau of US-AID and Ing. Leopoldo Sandoval and Ing. Jorge Castillo of the Indian Service. Future plans call for the improvement of the native, adapted open-pollinated varieties, the formation of synthetics, and after much education

over a period of many years, the introduction of intervarietal crosses and conventional hybrids.

We realize that we are covering only one phase in the life of the Maya. Concurrent with the improvement in his corn culture must be improvement in housing, sanitation, health, decreased infant mortality, farm credit, mechanization, nutrition, refrigeration for foodstuffs, electric lighting in his home, education and Christianity.

Memorandum for Mrs Coleman

In connection with the proposed Excursion to Guatemala, I believe the following points might well be kept in mind, when plans are made with the Travel Agents: (1) To include the most interesting botanical and horticultural features of Guatemala without, at the same time, overdoing this side of the trip; (2) visiting points of scenic and general interest; and (3) the comfort of the excursionists, which means that drives should not be too long inmany one day, and the best available accomodarions should be provided which will not be too easy if more than 50 people are involved. If, as you have suggested, there may be 100 ormmore on the excursion (as I sincerely hope will be the case) than there will have to be two groups, and the route followed in reverse order, or something like that.

As to the route, I have the following very tentative suggestions:

1st Day. Leave Guatemala City by 9 a.m. Drive to Palin and visit the lovely garden and nursery (mainly orchids and ornamentals) of Hugh Craggs at Palin. An hour there. Continue to Escuintla, where a good lunch can be had by dividing the crowd between Sarita's and the Texaco restaurant. After lunch, drive up the coast highway through Mazatenango, a beautiful region with much coffee, cacao, some bananas, some rubber, and many beautiful plants in dooryards. This will give the excursionists a fine look at the really tropical part of Guatemala. It will not, of course, include the tropical rain forest region to be seen only on theAtlantic side.

Leaving the coast (not really the coast, but the upper edge of the coastal plain, 1000 to 2000 feet) go up the long climb to Quezaltenango, reaching there in time for supper. It may be necessary to use both the Bonifaz and the Modelo for the night; both hotels are satisfactory, though the Bonifaz is the usual one for tourists. I am thinking of the number to be accomodated.

I do not advise going north to Huehuetenango as it is a long and not very interesting drive, and the ruins of Zaculeu are not important if the group is to visit Tikal and perhaps Iximché.

2nd Day. If there is plenty of time, perhaps this could be spent in the Quezaltenango area, where there are some good gardens. And if it happens to be market day at San Cristobal el Alto, go up there. It is going to be difficult to arrange the tour so as to hit market days everywhere - there are only one or two a week in each town. If the tour does not hit market day at San Cristobal, it might do so at Momostenango where the fine blankets are made.

3rd. Day. Proceed from Quezaltenango to Totonicapan and over the dirt road via Maria Tecum. This trip is not included on most tours but from the standpoint of the Garden's tour I think it is highly important, as it takes you up to 10,700 feet, thru beutiful coniferous forest, fir, pine and cypress and the páramo region. Because it is not a paved road it is usually not included in tours but it is not a bad road and everyone I have taken over this route has been delighted by the scenerry. You reach the Pan American Highway at Los Encuentros, 8500 feet, and go thence over the usual tourist route to Chichicastenango, the big show place of Guatemala, which is only worth seeing on Thursday or ~~Saturday~~ Sunday.

4th Day. In Chichicastenango. After lunch, drop down to Lake Atitlan through Sololá. Beautiful in the evenings, sundown, and early mornings. As many people as possible at the Hotel Tzanjuyu, right on the Lake shore, the rest at Casa Contenta, a quarter of a mile inland. Spend a day here, to rest after the long rides of the two previous days, wander around the valley which is really lovely. I believe everyone whould enjoy this day, the 4th.

5th Day. Leave Panajachel (Lake Atitlan) about 9 a.m., drive thru Patzum and see the church, one of the most interesting in Guatemala. Stop for lunch at Tecpan (there is a new restaurant on the highway, with good native food) and detour to the ruins of Iximché where Pedro de Alvarado established the first capital of Guatemala and made it his headquarters for some months. Continue to Antigua in late afternoon.

6th and 7th days. In Antigua. Visit the two museums, some of the most interesting ruins, and several houses, including the Popenoe house, the Chamberlain house, the Stillman house, the Willauer and Helen Webster house (adjoining), Mrs Palmer's house, and perhaps one or two others. Drive to San Antonio Aguas Calientes, one of the most interesting Indian villages in Guatemala, and up to San Juan del Obispo, visiting Finca Carmona, with one of the finest old gardens in this part of Guatemala. Perhaps on up to Santa Maria de Jesus, on the upper slopes ofnthe Volcan de Agua.

9th Day. Return to Guatemala and make the trip to Tikal.

If there is more time, then I would include a trip to the Alta Verapaz and down to Lake Izabal, and on down the Rio Dulce, thence back to Guatemala City.

If the excursion is to have 15 days in Guatemala, as I believe you have mentioned, the group will probably want to spend at least two days in Guatemala City, where they should certainly visit the Anthropological and Archeological Museum, a really fine thing. And a few of the fine gardens between the center of town and the airport.

I would like to emphasize that I think the valley and city of Antigua will be one of the high spots of the trip, and by spreading the group among the three hotels there will be accomodations for about 100 persons. Many will of course prefer the Hotel Antigua. Those who would like to live in the atmosphere of colonial Guatemala will like the Belen. And those who are interested in typical life of present-day Guatemala will find the Aurora very satisfactory.

W Popenoe

Wilson Popenoe

EARLY HISTORY OF THE AVOCADO.

By Wilson Popenoe.

Antes de llegar a Santa Marta está Yaharo que es en las caidas de sierras nevadas, Yaharo es buen puerto y buena tierra y aqui ay heredades de arboles de muchas frutas de comer y entre otras ay una que parece naranga, y cuando está sazonada para comer vuélvase amarilla: lo que tiene de dentro es como manteca y es de maravilloso sabor y deja el gusto tan bueno y tan blando que es cosa maravillosa.

When Martin Fernandez de Enciso wrote these lines he did not know that he was announcing to the Old World the discovery of a fruit which, four centuries later, would become the basis of an extensive horticultural industry in Florida and California. Indeed, when he wrote them Florida and California themselves were undiscovered to Europeans, who had only then commenced the exploration of the new continent.

Enciso, a man of learning, accompanied one of the first Spanish expeditions to the coast of northern South America. "He was a cartographer," writes Sir Clements Markham, "a good observer, and had the gift of lucid description." Let us translate his story of the avocado, which appeared in his "Suma de Geografia," published at Sevilla in 1519. "Before reaching Santa Marta," he says, "is Yaharo, which lies at the foot of the snow mountains, Yaharo is a good port, with good lands, and here are groves of many different sorts of edible fruits, among others is one which looks like an orange, and when it is ready for eating it turns yellowish; that which it contains is like butter and is of marvelous flavor, so good and pleasing to the palate that it is a marvelous thing."

Seven years passed, and another of the conquistadores described in print this new fruit. Gonzalo Fernandez de Oviedo, who had spent much time at the Spanish court, came to America in 1514. After wide

travel and observation, he returned to Spain and published in 1526 his "Sumario de la Natural Historia de las Indias," a brief account prepared at the request of the King, who was desirous of knowing as much as possible about the wonders of the New World. "On the mainland", wrote Oviedo, "are certain trees called pear trees, but they are not like those of Spain, though held in no less esteem; rather is their fruit of such a nature that they have many advantages over our pears. They are large trees, with broad leaves similar to those of the laurel, but larger and more green. They bear pears weighing a pound and even more, though some weigh less, and the color and shape is that of true pears, and the rind somewhat thicker, but softer, and in the center of the fruit is a seed like a peeled chestnut.....and between this and the rind is the part which is eaten, which is abundant, and is a paste very similar to butter and very good eating and of good taste."

Like Enciso, Oviedo had seen this tree in northern South America (Tierra Firme, it was then called) though some years later he published a more extensive work in which he mentioned having observed it in Nicaragua as well. None of the early accounts mentions the avocado as growing in the West Indies. Though botanists of the last century generally considered the tree indigenous to the islands, reference to the early accounts clearly shows this not to have been the case,--as was pointed out by G. N. Collins in his bulletin "The Avocado, a Salad Fruit from the Tropics", published by the U. S. Department of Agriculture in 1905. Incidentally, this bulletin laid the groundwork of modern avocado culture, and still ranks as one of the most interesting documents in the literature of this fruit tree. Eliminating, then, the West Indies, what was the distribution of the avocado at the time of the Conquest?

Pedro de Cieza de Leon, writing between 1532 and 1550, reported having seen the tree in the region which is now western Colombia.

Pursuing his travels southward, he noted its occurrence in the coastal valleys of Ecuador and Peru. He referred to it under the names "aguacate" and "palta": his work is the earliest in which I have found either of these words in print.

Francisco Cervantes Salazar seems to have been the first to chronicle the presence of this fruit in Mexico. Yet he did not describe it. His book "Mexico en 1554" lists it among fruits which were sold in the market of Tenochtitlan (the name by which Mexico City was known in those days). Not many years later,--some time previous to 1569; the exact date seems to be uncertain,--Fray Bernardino de Sahagun wrote his "Historia de las Cosas de Nueva España", in which he described several kinds of avocados, using the Aztec name aoacatl (more commonly spelled ahuacatl by subsequent writers; corrupted by the Spaniards to ahuacate and aguacate). One of his varieties went under the somewhat staggering designation of tlacocataoacatl.

An English merchant, by name Hawkes, whose travels in Mexico were published by Hakluyt in 1589, mentioned having seen this fruit, which with the usual clumsiness of the early writers in spelling plant names foreign to their tongues, he called alvacata. As far as I have been able to ascertain, this was the first mention of the avocado in an English publication.

In 1590 Father Joseph de Acosta published a work in which he differentiated between the small, thin skinned Mexican avocados, and the larger, thick skinned ones of South America. Yet he did not use the name aguacate, calling the Mexican forms instead by the Peruvian name palta.

This brings us down to the end of the sixteenth century, and we have clear evidence that the Spanish conquistadores found the avocado cultivated from Mexico to Peru. That remarkable man, Garcilaso de la Vega, son of one of Pizarro's warriors and an Inca princess, makes it

equally clear, however, that it was not grown in Peru many years before the advent of the Europeans. In his "Royal Commentaries of the Incas", published in 1605, Garcilaso recounts the deeds of his ancestors, the rulers of Peru: among other things, he says that "Tupac Inco Yupanqui marched to the province of Cañari, and on the road he conquered another called Palta, whence they brought to the warm valley near Cuzco the wholesome and delicious fruit called Palta". Here, then, we learn the origin of this name, as well as the approximate time the tree reached Peru from the territory which is now Ecuador; for it is known that Tupac Yupanqui's conquest of the northern provinces took place sometime about 1450 - 1475.

Less clear is the extent to which the tree had spread eastward from the Andean region. There is much evidence to indicate that it was not known in Brazil before the Conquest. We are warranted in believing that it was grown in the valleys of the Venezuelan Andes, where, as in Colombia, the vernacular name cura was current. And while speaking of vernacular names it may not be out of place to mention that there were many tribes in the extensive region between northern Mexico and southern Peru. These were of diverse linguistic affiliations, and usually had their own names for this fruit. In the Maya dialects of Yucatan and Guatemala, for example, we find on, okh, and the like; while in the Tarascan region of western Mexico it was cupanda. The Zapotecs of southern Mexico called (and still call) it yasu and isu. In some of the languages of Honduras and Salvador it was known as zial, hayi, and narimu; in Nicaragua and Costa Rica were found such names as sikia, kulup, amó, and devarva.

Though the avocado has not, to the present day, beengrown extensively in Europe,-- due, in large part, to the fact that none but the hardiest varieties will tolerate the cold climate of even the most

protected nooks on the warm Mediterranean coast of Spain, France, and Italy,--we have record of its early introduction into the Old World from the New. Clusius, in his "Rariorum Plantarum Historia", published at Antwerp in 1601, gives a fairly complete botanical description of the tree, based upon specimens grown in a garden at Valencia, Spain. Both from his statements, and from our present knowledge of the climatic requirements of the several horticultural races, we can be fairly safe in assuming that this particular avocado was of Mexican origin. Clusius states that the owner told him the common name in the Indies was "mamay", but that later he learned from the erudite Simon de Tovar (who also had one of the trees in his garden) that its correct name is "aguacate".

Twenty-five years ago, when avocado growing first began to attract serious attention in California and Florida, horticulturists found that the seedling forms growing in these regions, as well as in the American tropics, could conveniently be divided into three groups or races, based upon fiarly well defined characteristics of tree and fruit. The kind most abundant in Florida and the West Indies was first termed the West Indian-South American type. Later this was simplified to West Indian. The other two, less commonly grown in Florida but to all practical purposes the only ones known in California, were called the Guatemalan and Mexican types,--or to use the term which ultimately met with general acceptance, races.

I imagine North American horticulturists, in adopting this classification of cultivated avocados, thought they were developing something new. I can say, at least, that such was my own feeling at the time the distinguishing characteristics of these three groups were being discussed and catalogued.

Let us turn, therefore, to the work of Fray Bernabe Cobo and see how greatly mistaken we were. This worthy, in his "Historia del Nueva

Mundo", which was written in 1653, says:

The palta is a tree of very attractive appearance, shapely, the size of a large fig tree, symmetricallybranched and moderately spreading; its leaf is similar to that of the mulberry, a trifle larger, and its fruit is one of the finest in the Indies: in fact, many give it the palm, placing it ahead of all others. It is spindle-shaped and commonly the size of an average quince; in some regions it becomes as big as a small squash or large citron, the varieties of the province of Yucatan in New Spain (Mexico) being of this class. The palta has a thin skin, more tender and flexible than that of a Ceuta lemon, green externally, and when the fruit is quite ripe, peeling readily. It has the largest seed that I have ever seen in any fruit, either in the Indies or Europe..... Between the seed and the rind is the meat, slightly thicker than one's finger except at the neck where it is very thick. It is of whitish green color, tender, buttery, and very soft. Some people eat it with sugar and salt, others just as it comes from the tree, it being of such good flavor that it requires no seasoning.....

There are three different kinds of Paltas. The second kind is a large, round one which is produced in the province of Guatemala, and which does not have as smooth skin as the first. The third is a small Palta found in Mexico, which in size, color, and form resembles a Breva fig; some are round and others elongated, and the skin is as thin and smooth as that of a plum.....The name Palta is current in the language of Peru. In the major portion of the Indies the fruit is called aguacate..

At the beginning of the present century, when avocado growing first began to receive serious attention in the United States, there was great divergence of opinion regarding the correct name for this fruit. Collins, in his classic bulletin mentioned earlier in this article, had listed forty names; some of these, however, were nothing more than orthographical variants, two or three perhaps mere typographical errors in the publications where they originally appeared. In Florida, the accepted appelation was alligator pear, often, perhaps usually, abbreviated to "pear" and occasionally "gator pear"; while in California, whither the f fruit had wandered northward from Mexico instead of the West Indies, the name aguacate was common, as well as alligator pear. And in both California and Florida, avocado and avocado pear had met with considerable acceptance.

Interested horticulturists felt that it was a mistake to encourage,- even to tolerate,--further use of alligator pear, on the grounds that this name was misleading, ungraceful, and generally objectionable.

The American Pological Society and the U. S. Department of Agriculture,--both arbiters of high standing,--approved and adopted avocado, but the Californians leaned toward aguacate, and for a time stuck to their guns. They even went so far as to undertake a return to the purer spelling ahuacate. Eventually, however, they gave up what appeared a useless fight and joined the Easterners in sponsoring avocado. It seemed highly probable, at this time, that alligator pear would become the accepted commercial name unless all concerned got together on some other, less objectionable one. Since that time, the Californians have coined a new word, Calavo, by which they distinguish California-grown avocados of a certain standard of quality from all other avocados on the market,--but that is another story which has no place in this tale.

Having adopted avocado, the history of this name became a matter of some interest. It can be traced back in the literature and its origin established with satisfactory accuracy.

In the year 1655, the British took possession of Jamaica, an island which up to that time had been in the hands of the Spaniards, who had, at an early date, established settlements there. The avocado had been brought over from the mainland, and had found a congenial home on the island.

In 1657 there was published at London a curious little work entitled "A Book of the Continuation of Foreign Passages". Under the heading, "A Brief Description of the Island of Jamaica" mention is made of "Avocatas, a wholesome, pleasant fruit; in season in August, and sold for eight pence per piece." The high price (for those times) suggests that the fruit was still something of a rarity.

This, then is the first statement which has been found in British literature regarding the occurrence of the avocado in the West

Indies. A few years later (1660) the poet Cowley extolled the virtues of this fruit (he called it aguacata), but his verse adds nothing to our knowledge of its history or distribution. It was not until 1672 (unless we have overlooked some obscure account) that an extensive description appeared in our language. This was contained in a classical work by W. Hughes, entitled "The American Physitian", and is of sufficient interest to warrant our reprinting it here. It is as follows:

Of the Spanish Pear

This is a reasonable high and well-spread tree, whose leaves are smooth, and of a pale green colour; the Fruit is of the fashion of a Fig, but very smooth on the outside, and as big in bulk as a Slipper-Pear; of a brown colour, having a stone in the middle as big as an Apricock, but round, hard and smooth; the outer paring or rinde is, as it were, a kind of a shell, almost like an Acorn-shell, but not altogether so tough; yet the middle substance (I mean between the stone and the paring, or outer crusty rinde) is very soft and tender, almost as soft as the pulp of a Pippin nut over-roasted.

Place

It groweth in divers places in Jamaica, and the truth is, I never saw it elsewhere; but it is possible it may be in other Islands adjacent, which are not much different in Latitude.

Name

I never heard it called by any other name than the Spanish Pear, or by some the Shell-Pear; and I suppose it is so called only by the English (knowing no other name for it) because it was there planted by Spaniards before our Countrymen had any being there; or else because it hath a kinde of shell or crusty out-side.

Use

I think it to be one of the most rare and most pleasant Fruits of that Island; it nourisheth and strengtheneth the body, corroborating the vital spirits, and procuring lust exceedingly; the Pulp being taken out and macerated in some convenient thing, and eaten with a little Vinegar and Pepper, or several other ways, is very delicious meat.

It seems strange that Hughes did not hear "it called by any other name than the Spanish Pear, or by some the Shell Pear", in view of the fact that the "Book of the Continuation of Foreign Passages", fifteen years earlier, had used a common name of Spanish origin, while Sir Hans Sloane, twenty-four years later, reported several.

It is to Sloane, indeed, that we must look for the first record

of the name now generally accepted,--avocado. This distinguished naturalist published in 1696 a catalogue of the plants of Jamaica, among which he listed, but did not describe, this tree. He referred to many previous accounts, and made the observation in Latin: "The Avocado or Allegator Pear-Tree. It grows in gardens and fields throughout Jamaica." Some thirty years later, in 1725, he published an extensive work entitled "A Voyage to the Islands of Madera, Barbados, Nieves, St. Christophers, and Jamaica" in which was included a natural history of the last-named island. One chapter was devoted to "The Albecato Pear-Tree; Spanish, Abacado, or Avocado".

It is obvious that all of these words, as well as the earlier avocata, were corruptions of the Spanish name aguacate. And as regards alligator, the difference appears to be one of degree, not of kind, for we can only infer that it is an extreme, just as avocata is a moderate, adaptation. We see, therefore, that our chosen name for this fruit enjoys no very high standing on the grounds of purity, nor can we honestly say that it is particularly appropriate; it represents a compromise, made primarily with the object of relegating to the limbo or innocuous desuetude the objectionable Alligator pear,--a purpose, I may add, which unfortunately has not been wholly achieved.

BANANA CULTURE IN THE STATE OF ISRAEL

By: Wilson Popenoe, based on visit of July 1958

Summary

1. According to Asaph Goor, Director of Horiculture in the Ministry of Agriculture, there are between 4000 and 4500 acres of bananas in commercial plantings. All are of the Cavendish variety. In 1956 the total production was about 22,000 tons of fruit, of which about 1000 tons went to Greece, Cyprus and Yugoslavia. The rest consumed in Israel.

2. By taking in a few areas not yet planted, and by more efficient use of land now in production (reducing the time certain areas are out of production due to crop rotation) total acreage in production annually, ten years from now, might rise to 10,000 acres, though local authorities only 7,000.

3. No soils which in Central America would be called first-class banana lands were seen by me. I would term those in cultivation second class to poor second class, because of the high percentage of sticky clays or mixtures of clays and coarse gravel.

4. Climates in practically all banana regions are marginal, not so much because of frosts which damage plantations once in a while, but because of the long cool season which retards development of plants and fruit and unfavorably affects the size and character of the bunch.

5. Cultural practices, to which intensive study is being given, are in general good. The banana industry in Israel is new. In the following pages I mention certain details which we would question in the light of Central American, and more particularly Jamaican, experience. We cannot apply all of our experience to conditions in Israel.

General

This report on a visit of ten days to Israel, late in July 1958. During my stay I visited all of the important banana-growing regions, accompanied, at one time or another, by one of the technical members of the Ministry of Agriculture. I am greatly indebted to these men, especially the following: Dr. Asaph Goor, mentioned in the summary; Dr. Chanan Oppenheimer, of the Research Station at Rehovot; Zalman Rapaport, Chief, Division of Tree and Vine Crops, Ministry of Agriculture; Robert Ticho, in charge of Horicultural work in the northern part of the country; and Sh.Zmirin of the Kibutz Kinneret at the southern end of the Sea of Galilee.

Banana Regions

Based on considerations of climate and perhaps to a lesser extent, soils, it is customary to divide the country as follows: (1) the Jordan valley, around the southern end of the Sea of Galilee, and (2) the Costal Plain, which includes western Galilee north of Haifa the strip between Mount Carmel (a long ridge) and the sea, and the coastal area below Tel Aviv. I understand about two thirds of all banana plantations are in the coastal area, one third in the Jordan valley. This latter area is considered to have the warmer climate.

Zmirin says "The difference betweem the various seasons causes the period between shooting and harvesting to vary from 80 to 240 days. The normal period, 80 to 120 days, applies only to stems shot in early summer. The period from shooting to maturity is shorter in the Jordan valley than elsewhere." It seems to me the range from 80 to 240 days, shooting to maturity, is extremely interesting and suggests climatic conditions (or more properly, temperatures) much more variable than those of Central America.

To take advantage of the most favorable conditions of temperature, they desire to have plants "shoot" in July and the first part of August. In the attempt to achieve this they practice "timed pruning" and cutting back of suckers which will be mentioned later - this problem reminds me of the old days in Jamaica when "timed pruning" was practiced to avoid the hurricane season. Zmirin says "every delay of a week or ten days in shooting, after the month of August, is serious. Bunches shot in September and October, on the coastal plain, remain on the plant through the winter of course, and take 240 or even 250 days to mature - though only about 210 in the Jordan valley.

Obviously there are many areas in Israel which are too cold for banana cultivation; the coast, where are to be found most of the plantations, damaging frosts are said to occur every three or four years.

Soils

I visited the area south of Rehovot first. Here the soils are light clays and sandy clays, rather sticky when wet. They struck me as very much like the soils around Vere in Jamaica, where we used to have quite a bit of trouble with our bananas. We would definitely term them second class at best. Northward on the coastal plain I noted soils more granular in texture, light clays, with a good deal of coarse gravel in some areas. In the Jordan valley the soils are heavy. I doubt that we would plant them at all.

In the Rehovot and a few other areas they do not seem to worry about rotating bananas with other crops. In the Jordan this is a major problem which I do not believe they have yet solved satisfactorily I believe they over irrigate their soils. They raise the water table to a dangerous point and as they do not practice surface tillage of any

sort, the soils become, in two or three years, compact and too wet below. After two or three crops of bananas on such soils they abandon the bananas, deep-plow the soils, and plant other crops - potatoes, corn, cereals, tomatoes. Formerly they did not replant these lands with bananas for seven or eight years. They have reduced the period to three or four years, and I believe if they reduce the amount of water used for irrigation (water is abundant in this region,, hence they do not consider that factor at all) and find some way of loosening the soils from time to time, they could maintain these lands in cultivation, with occasional replanting immediately after abandonment of an old area.

The pH of their soils, I am told, is high.

Planting Material

They have used principally sword suckers of large size in the past. They do not seem to have any good arguments favoring sword suckers against heads, and in fact there is a strong trend toward the use of heads at present. They say the interval between planting suckers and maturity of the first crop is 12 to 15 months, which I believe agrees fairly well with Central American experience. In talking with the horiculturists at Kibutz Kinneret, right where the River Jordan takes off from the Sea of Galilee, I gained the impression they will go over to heads completely. Incidentally, I would like to mention that much of the land planted to bananas in Isreal is operated under the Kibutz system. A Kibutz is an agricultural cooperative, a colony working government land but with almost complete autonomy and with a communistic set-up. In fact one member of a Kibutz told us "This is communism, but without fear." We were told there are about 70,000 people living under the Kibutz system in Israel today. Everybody works, men and women. Nobody gets any salary. You are furnished housing and clothing, you get plenty to eat, and your children are cared for in a community nursery. As far as we could learn the system is working very well. Once accepted in a Kibutz, few people seem to leave but you are free to do so if you wish .

Spacing and Pruning

They usually plant in March. As in other countries, several different spacings are common. A popular one is 3 by 2-1/2 meters, which they say gives 520 plants per acre. (It is hardly correct to use our term "mat" because the system is to carry one mother plant with one follower). Sometimes, in the Jordan valley, they alternate the production of suckers, allowing one plant to carry two, the succeeding plant only one. On the coastal plain it is standard practice to retain only one follower to each mother plant. This, they believe, hastens the time between appearance of the follower and "shooting". Zmirin says "Quite frequently this one sucker is too strong, resulting in the production of a worthless bunch during the cold season, and

in such cases two suckers must be left". There is another practice in this connection which we discussed on several occasions, but our experience in tropical America would definitely be against it: When they think a sucker is to far advanced and the plant is going to "shoot" at an unfavorable period, they cut off this sucker which may often be 4 or 5 inches in diameter at the base. "Beheading" is done about two feet above the ground. I think our experience would indicate that such beheaded suckers when left to produce fruit are likely to produce small and malformed bunches. The practice indicates to what extremes they have gone, in order to bring plants into production at a favorable time of year.

Cultural Practices

Tillage is practically unknown. Fertilizing is done in two ways; they scatter goat or other animal manure over the surface when they can get this material, and they apply chemical fertilizers on the surface, both practices being opposed to what they do in the Canary Islands, where they go the limit in the use of fertilizes, both organic and inorganic, but work them lightly into the soil. It appeared to me that goat manure scattered on the surface was doing little good. Instead of leaving banana trash on the ground, to decompose and put some organic matter into the soil, they drag it out to the nearest road and pile it up out of the way. They say they can not irrigate efficiently if they leave it within the plantation.

As Zmirin says, "All banana plantations in Israel are irrigated, usually from April to October, or a period of about 200 days "In the southern area small sprinkler systems are popular and do a good job, one reason being that there is no temptation to over-irrigate. I am told they give between 20 and 25 irrigations per season with these outfits, and I was favorably impressed by the condition of the plantations where the sprinkler system is used.

In the Jordan valley surface irrigation is employed, as already mentioned, and I believe their practices in this connection can stand a lot of improvement. Instead of irrigation in checks or basins containing 4 to 8 plants as is done in the Canary Islands (where the water, which is worth its weight in gold, is carried throughout the plantation in very small but completely lined canals) they prepare borders every two to four rows, and run the water as many as 500 feet or even more, between these ridges. Obviously, the plants at the beginning of these runs get a lot more water than those at the end; as a matter of fact they often get too much. I asked how many acre inches they thought they were giving at one application, and they replied that it is probably four to six. No measurements are taken because they have the whole Sea of Galilee to draw on and it is free.

Production

Zmirin says there are four months when bananas are in short

supply, these being June to September. He says they can only put about 12% of the total crop on the market during that period. There are five months of good supply, October to February, with 45% of the total crop. There are three months of abundant supply, March to May, during which they market about 43% of the total crop.

Again citing Zmirin, who really has done quite a job in bringing together the best available figures, yields are somewhat as follows: In the Jordan valley, four tons per acre in the first crop, 12 tons in the second crop, and six tons in the third crop. After this crop it is the custom, up to now, to tear out bananas and rotate with some other crop, as has been mentioned above.

On the coast the first crop is about six tons per acre, the second and third crops (if thinning to one follower for each mother plant has been practiced, as is usually the case), eight to 10 tons per acre. I must say I was pleasantly surprised by the large size of many of the bunches seen.

It remains only to mention the matter of varieties, as this may become an important consideration in the future. Up to now, everything is straight Cavendish - I cannot see any indications that they have anything different from the Cavendish of the Canaries. They would like to try other forms of the Cavendish group. Mr. Ticho got some heads of the Williams Hybrid from Australia, but they have not yet been brought to Israel for fear of introducing bunchy top. I believe they are being held in a greenhouse in Denmark for a while. They do not intend to import material of any sort which might bring diseases, as their plantations at this time are remarkably clean - no Sigatoka or anything else, so far as I saw.

Around the Cavendish plantations they often plant rows, as windbreaks, of what they call the "Arab"banana. This appears to be the same as our manzano, butuco, topocho, burro, cuatro filos, etc., the banana of rocky hillsides and poor soils all over Central America, where it is a Godsend because it gives poor farmers on the mountainsides something to eat. Agriculturally, Israel is and always will be a poor country, because of the large number of inhabitants per acre of really decent soil. This situation is going to grow worse, for immigrants are arriving every month in great numbers One would think that they would plant Arab bananas on a lot of land too poor and dry for Cavendish, so as to get something to eat from that land, but they are not doing it. Maybe it is the name "Arab bananaa" that deters them!

[1920]

MEMORANDUM REGARDING
THE PROPOSED EXPEDITION TO CENTRAL AMERICA AND
WESTERN SOUTH AMERICA.

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Avocado growing has assumed commercial proportions in California and in Florida. The total area now planted to this fruit in the United States approaches one thousand acres. In Florida, one nursery alone is producing annually more than twenty thousand budded trees.

Hand-in-hand with the development of the industry in this country comes a need for varieties adapted to different climatic and soil conditions, varieties adapted for shipping to distant markets, and varieties ripening at different seasons of the year, so as to supply the market continually. These needs are more acute at the present time than ever before. In order to meet them, this Office undertook three years ago an exploration of Guatemala for the purpose of obtaining and introducing into the United States new varieties likely to prove of value. This exploration resulted in the successful introduction of about twenty-five selected varieties which are now on trial in California, Florida, Porto Rico, Cuba, the Isle of Pines, Hawaii, Japan and Samoa. The work will thus affect not only avocado growing on the mainland of the United States, but in our tropical dependencies and generally throughout the

tropics and subtropics. The Guatemalan varieties appear very promising because of their excellent quality, desirable season of ripening, and ability to withstand shipping to long distances.

It has been urged upon this Department that the explorations be continued until all promising regions in tropical America shall have been covered in the searbh for avocados which may be of value in the development of commercial avocado growing. The desirability of immediate action has been particularly pointed out. Much loss will be avoided if American avocado growers can be supplied in the near future with the best available varieties for planting in their orchards; if further explorations are deferred until a later time, the varieties brought to light may necessitate the working over of large areas in this country which have been planted to inferior sorts.

We have explored Guatemalan avocado regions as thoroughly as necessary. Mexico has been covered, but not thoroughly. Further explorations in this republic are desirable, but will have to be deferred until a later time, when conditions are more favorable. The West Indies probably have little more to offer us. This Office has conducted an exploration of Cuba which has shown that few varieties of value are to be obtained in that Island. We have also investigated the avocados of Brazil and know that they hold little promise.

The territory which remains to be investigated

lies upon the mainland of tropical America. It extends from Guatemala on the north to Chile on the south, but does not include the eastern slope of south America with the exception of Venezuela, which country deserves investigation. It is now proposed to undertake a careful exploration of the interesting portions of this territory, in order to complete the survey of tropical America for avocados, and obtain the most promising sorts for introduction. In addition to avocado varieties, there are other aims of the expedition; the wild relatives of the avocado should be studied, and in some cases introduced for use in connection with avocado breeding in this country; the cultivated food plants of the Central and South Americans should be studied, and many of them introduced for trial in the United States; and numerous wild fruits, forage plants, fiber plants, and other plants of possible economic value should be obtained.

The expedition which it is desired to put into the field this coming autumn should plan to devote 18 months to this work. It is estimated that the expenses can be held down, by practicing the most rigid economy, to $3000 per calendar year, not including the salary of an explorer. In order to show in greater detail the work which the expedition is expected to do, and the plants which it hopes to obtain, the following notes are appended, classified under the names of the countries the expedition is planned to visit:

GUATEMALA. After leaving the United States, the explorer will first stop in Guatemala, in order to revisit the trees studied during the previous exploration of this country and make further notes on them, and to obtain a large quantity of avocado seeds for the production of stock plants in Washington, upon which to bud the avocado varieties to be introduced during the course of the further explorations. We have found that Guatemala is our best source of avocado seeds for stock plants, and the only way in which a large supply of these seeds can be obtained safely is by a personal visit. In addition to securing these seeds, it is desired to obtain budwood of two choice varieties of the coyó (Persea schiedeana) which have been located in northern Guatemala by one of our correspondents, Roberto W. Hempstead, and to obtain further material of the interesting anay, a wild relative of the avocado not yet identified botanically. We also desire additional supplies of seeds of several plants which were introduced by the previous expedition to Guatemala, and which look very promising in the United States. The most important of these are: Guaiacum guatemalensis, a small tree with very hard wood and handsome flowers, which gives promise of becoming a valuable hedge and ornamental plant in Florida; Dahlia maxoni, the rare tree dahlia of northern Guatemala, of which two double flowered varieties are known and should be obtained for our nurserymen; Chamaedorea sp., the pacayito, a

dwarf palm which promises to be of value for house culture in the North; Chayota edulis, the chayote, of which there are many cultivated varieties in Guatemala; and the rare Annona testudinea and A. scleroderma of northern Guatemala, two species which are of unusual value for use in annona breeding in this country.

Two to three months will probably be required to do the necessary work in Guatemala.

COSTA RICA. This is one of the most promising fields to explore for new avocado varieties. It is known that the avocado is extensively grown in the mountainous parts of this country, and it is desired to spend considerable time making a careful study of the different forms and selecting those which merit introduction into the United States. There is also, in this country, a wild avocado called yás, probably Persea pittieri, which produces edible fruits, and which is said to be hardier than the true avocados. This should be obtained for use in developing hardy varieties of the avocado for culture in the cooler parts of California and Florida. In addition to avocados, there are a number of other fruits in Costa Rica which should be studied, and some of them introduced into this country. The Myrtaceae, the Annonaceae, and other groups are important. There are wild species of Rubus which should be obtained, cultivated varieties of the chayote and other vegetables, and probably other valuable plants.

It would probably be necessary to spend four or

five months in Costa Rica, perhaps visiting the country two different times, in order to be there at different seasons of the year.

PANAMA. A short stop should be made in Panama in order to visit the Chiriqui region, where Henri Pittier says the avocado grows wild in the mountains in the greatest abundance.

COLOMBIA. This country is one of the most important to be included in the itinerary. In the mountainous districts there are many avocados, and they have never been studied by anyone having in mind their usefulness to horticulture. There are also many other fruits worthy of investigation. An immense blackberry has been reported, and should be introduced. There is a large pineapple said to occur wild in the colder parts of the country. There are many native forage grasses which should be introduced for trial in the United States.

It would probably be necessary to spend three or four months in Colombia.

ECUADOR. Avocados are known to be cultivated in Ecuador at high elevations. It is desired to study these hardy forms, and to obtain any of them which seem to be promising. There are also other fruits in this country which are worthy of introduction into the United States.

Probably not more than one or two months would be required in Ecuador.

PERU. In the high mountain valleys of Peru the avocado has been grown since very early times, as evidenced by the presence of a name for this fruit in the native Quichua language. It is desired to investigate the forms grown here, in order to determine whether or not there are any which are distinct from those of Central America and the West Indies. If interesting new forms are found to occur, they should be introduced into the United States for trial.

The food plants of the ancient Peruvians, which have been studied by O.F.Cook, in several instances merit more horticultural attention in the United States than has yet been devoted to them. It is proposed to obtain living material of several of the root crops, edible grains, and fruits which are found in this country. It may also be possible to obtain here interesting strains of some of the European fruits and economic plants; giant almonds are reported from Chachapoyas, alfalfa growing at high elevations, and many temperate fruits in the cold parts of the country.

Two or three months at least should be spend in Peru.

BOLIVIA. It is not certain that it will be necessary for the expedition to visit Bolivia. Inquiries will be made, and if it is found that there are not good prospects of finding avocados of interest it may be left out of the itinerary. In the higher parts of this country there should be a number of interesting

plants for introduction into the United States. The petioles of a species of Gunnera are eaten like rhubarb. The yacón is a large crucifer with edible tubers. Numerous solanaceous fruits are found. The Caricas offer possibilities in connection with the development of papaya culture in the United States. Several species are known in Bolivia, and in some of the other South American countries it is proposed to visit. They should be obtained.

CHILE. Since this country has a well-developed agriculture and horticulture it offers excellent possibilities of obtaining valuable strains and varieties of cultivated plants. The hardy Mexican race of avocados is extensively grown in this country, and it is hoped to find superior varieties worthy of introduction into the United States. A kind of rhubarb which grows 15 feet high is reported from the southern part of the country. There are numerous myrtaceous fruits of interest. Several native forage crops should be investigated and, possibly, introduced into the United States for trial.

It would probably be necessary to spend several months in Chile.

VENEZUELA. After working down the western coast of South America, it is proposed to cross the Isthmus on the return trip and stop in Venezuela to investigate the remarkable <u>verraneo</u> avocado which Pittier discovered near Caracas. This is a variety which ripens out of

season. There are also many other plants in Venezuela which are promising. Wheat varieties, cotton varieties, several native Passifloras with edible fruits, specialized varieties of Indian corn, and wild species of Rubus are all of interest and possible value.

It is planned to spend only a short time in Venezuela, after which the explorer would return to the United States, probably via the West Indies and New York.

Assessment

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INFORME Nº 2.-

ENTREVISTA AL DOCTOR WILSON F. POPENOE EN GUATEMALA ANTIGUA

La misión Peruana de Observación y Estudio de la Educación Agrícola, concluida su estadía en la Escuela Agrícola Panamericana de Honduras el 30 de Junio de 1970, viajó a Guatemala, donde fué recibida por el Dr. Wilson F. Popenoe, trasladándose a la Ciudad de Antigua en donde, vencidos algunos trámites, mantuvo una entrevista inicial con el Dr. Popenoe, en la cual se trató de captar algo de la vasta y magnífica experiencia del entrevistado, con conocimiento de la realidad Centroamericana desde 1914.

Debe destacarse que el Dr. W. Popenoe en una demostración de gentileza muy especial recibió a nuestra Misión, retrazando un viaje a Europa, previsto con anterioridad.

La reunión del primero de junio sirvió para conocer los primeros contactos de este pionero de la fruticultura y la educación con el mundo Iberoamericano, sus trabajos como experto frutícola en la United Fruit Company, el fomento de diversas variedades de plátanos, mangos, cítricos y aguacates al fundar la Estación Experimental de Lancetilla.

Mención especial merece la introducción de la variedad de aguacate "Fuerte" en territorio californiano y en el medio dia europeo.

En 1940, Mr. Samuel Zemurray comprendiendo que para estimular el desarrollo agrícola del Itsmo Centroamericano, se requería la organización de una escuela de Agricultura y conociendo la vasta experiencia del Dr. W. Popenoe, así como su gran cariño por la región, le encargó escoger el lugar y organizar una Escuela Agrícola que atendiera la formación de personal preparado para toda el área.

Se inició así una nueva etapa en la vida profesional del Dr. Popenoe, quien viajó por todo Centroamérica buscando un lugar que fuese amplio, con recursos de agua, calidades de tierra representativos de toda la zona, apropiadamente ubicado con relación a una ciudad, de manera que asegurase los aprovisionamientos y comunicaciones y evitara que una cercanía excesiva perturbara los estudios ó investigaciones que en la nueva Escuela deberian efectuarse; finalmente escogió el Valle de El Zamorano cercano 36 Km. de Tegucigalpa, Honduras.

Estos factores determinantes de ubicación, considera el Dr. Popenoe que siempre deben tenerse en cuenta al organizar instituciones agrícolas como El Zamorano o el Centro Piloto Cañete.

La entrevista siguió brindando magnífica experiencia al grupo Peruano, al informarse por medio del propio fundador de los pasos sucesivos de la Escuela, su determinación del área, ampliación de caminos, ubicación del campus, construcción de edificios para internado, aulas, oficinas, residencia de empleados y docentes, organización del ciclo académico, equipamiento, primeros cultivos, nivel inicial de estudios, egreso de los primeros Zamoranos, los reajustes en los planes de estudios al ir elevando el Centro, el nivel académico, sin variar en absoluto la base conceptual de su formación y clave de su permanente éxito: combinación acertada y justa de teoría y práctica, de manera que el profesional Agrícola formado sepa realizar las variadas faenas y actividades de un Rancho, y por qué se efectúan.

Esta orientación de la EAP la propició el Dr. Popenoe durante 15 años en que ejerció la dirección y tiene la virtud que pasados

los 25 años de funcionamiento se mentiene en plenitud pese a los cambios de personal, adelanto de técnicas y ciencias agropecuarias, revelando así lo ventajoso y apropiado que ha resultado esta planificación.

La entrevista al Dr. Popenoe continuó el siguiente día, tras una visita en su compañía a la zona rural de Antigua para visitar la Estación Experimental de Chinaltenango y varias fincas en las que nuestro entrevistado continúa brindando sus conocimientos y experiencias en ensayos y cultivos de café, frutales y horticultura ornamental. Se visitó asi mismo la Escuela Normal Rural Mixta "Pedro Molina" (que funciona en lo que fuera primera Sede del Instituto Agrícola de Bárcena) enterándonos de su funcionamiento y articulación al Sistema educativo guatemalteco.

La tarde del 2 de junio permitió culminar la entrevista y procurar captar el mayor bagaje de experiencias y recomendaciones de un profesional probo é íntegro como el Dr. Wilson F. Popenoe, información que estamos seguros ha de sernos de gran utilidad para normar toda la información que acumulemos en la gira y canalizarla de manera de hacer una pronta y permanente realidad el Centro Piloto de Educación Agrícola de Cañete, Perú.

DESARROLLO EN EL ALTIPLANO GUATEMALTECO, MANZANAS Y PERAS

Eduardo A. Matheu* y Wilson Popenoe**

RESUMEN

El factor crucial en la producción de manzanas y peras en el altiplano de Guatemala es el requerimiento de frio (chilling requirement). Las temperaturas adecuadas para manzanas y peras usualmente cultivadas ocurren entre 1,800 y 2,400 m. (6,000 y 8,000 pies) de elevación.

Ocho años de observaciones en el campo indican que Winter Banana y Wealthy son la base de la producción comercial de manzanas debido a su requerimiento de frio. Con introducciones se ha logrado "Vista Bella" y "Anna", de la universidad de Rutgers e Israel, respectivamente. Vista Bella es roja y la primera en madurar a finales de julio a 2,280 m. (7,500 pies). Anna produce bien a 1,500 m. (4,950 pies), lo que amplía la zona de cultivo considerablemente. Los patrones Malling Merton desarrollan lentamente, forman árboles muy enanos y sus prácticas culturales son muy complejas; por lo que continúan en la fase experimental.

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** Antigua Guatemala, Guatemala, C. A.

La pera Ayres del sur de los Estados Unidos es una híbrida que produce bien a 2,120 m. (7,000 pies). Compite en calidad con las peras europeas que necesitan mayor altura. La introducción de Pyrus calleryana como patrón permite formar huertos tres años más rápido al sustituir la Manzanilla, Crataegus mexicana (C. stipulosa, C. pubescens). Calleryana aunque está en observación ya se usa a nivel comercial.

Estas observaciones han creado un nuevo contexto que requiere prácticas culturales apropiadas. Estas prácticas serán de valor unicamente si sí toman en cuenta la gran variedad de micro-climas.

ABSTRACT

The crucial factor in the production of apples and pears in the highlands of Guatemala is the chilling requirement. Adequate temperatures for apples and pears commonly grown occur between 1,800 and 2,400 m. (6,000 and 8,000 ft.) above sea level.

Eight years of ~~es~~ field observations indicate that Winter Banana and Wealthy provide a basis for commercial apple production because of their low chilling requirement. "Vista Bella" and "Anna", from Rutgers University and Israel, respectively, represent successful introductions. Vista Bella is a red variety maturing in late July when planted at an elevation of 2,270 m. (7,500 ft.). Anna

does well at 1,500 m. (4,950 ft.), increasing the growing area considerably. Malling Merton rootstocks continue to be experimental since they develop very slowly, form exceedingly dwarfed trees, and require complex cultural practices.

Ayres, a pear from the South East of the United States, is a hybrid that does well at 2,000 m. (6,600ft.). In quality it competes favorably with European pears which require higher altitudes. The introduction of Pyrus calleryana as a rootstock permits establishing an orchard three years earlier than when Manzanilla (Crataegus mexicana, syn. C. stipulosa, C. pubescens) is used. Although Pyrus calleryana is still at the experimental level, it is commercially employed.

These observations have created a new context that requires appropiate cultural practices; which will be of value only if they take into account the diversity of micro-climates.

El frio en los micro-climas de las montanas de Guatemala y variedades con un requerimiento bajo de frio (chilling requirement) han permitido el cultivo de manzanas y peras. El cultivo comercial se encuentra entre los 1,800 y 2,400 m. (6,000 y 8,000 pies). Los principales problemas de producción se derivan de los micro-

climas y las variedades de cada fruta que se quieren producir.

Las variedades ya no son, o son menor problema pues ocho años de observaciones indican que Winter Banana y Wealthy son por ahora una base satisfactoria para la producción comercial de manzanas. Winter Banana se siembra a nivel comercial desde los 1,970 m. a 2,425 m. (6,500 a 8,000 pies). Su comportamiento es bastante variable, entre los 1,970 m. y 2,270 m. (6,500 y 7,500 pies) las yemas vegetativas y florales se abren durante dos meses y este período aumenta si el invierno ha sido caliente. Hay primaveras en las cuales yemas de toda una rama no abren y otras ramas solo abren yemas apicales, síntoma clásico de la falta de frio. A pesar de esto la producción es posible pues tres cuartas partes del arbol si abre yemas. Arriba de los 2,270 m. (7,500 pies) la apertura de yemas es pareja pero el período de floración es mayor o menor en duración en relación a la cantidad de frio. En las zonas como Huitan, arriba de los 2,425 m. (8,000 pies) hay dos períodos de floración distintos. El primero ocurre a finales de Diciembre y el segundo en marzo. El año en que no hay heladas fuertes la primera cosecha es producida a finales de mayo y en junio. La segunda cosecha sale en agosto y septiembre. La causa de las dos cosechas parece ser el bajo

requerimiento de frio de la variedad. Parece que fisiologicamente el arbol esta dividido, siendo una zona donde el frio es continuo durante el invierno, ciertas yemas termina el período de latencia en diciembre y brotan mientras otras lo hacen hasta marzo. Esta variación claramente afecta las prácticas culturales y se debe a tantos micro-climas existentes en la zona. Wealthy es mas tardía que Winter Banana produciendo una cosecha en octubre. Las dos variedades pueden variar un mes en su epoca de maduración . Se adelantan o se retrasan segun el invierno anterior. Si el invierno es frio la cosecha sale un mes antes; al ser caliente se retrasa un mes y se prolonga puesto que la floración ha sido mas dispareja.

Otras variedades de importancia existen en Guatemala, entre ellas "Juarez" que probablemente es la Delicious original, siendo su zona de producción igual a la de Winter Banana. Esta variedad se propaga a escala comercial aunque tiene una enfermedad que ha sido confirmada como de la Delicious por el patólogo Dr. Eugenio Schieber. El Dr. Vorhies de California comenta que en Washington muchos árboles de Delicious se estan descartando debido a esta enfermedad. En Guatemala se cree que la enfermedad no es mortal, pero su virulencia varía segun el clima y hay lugares donde parece que los árboles mueren a causa de la enfermedad.

Todo el mundo quiere una manzana roja en su totalidad, lo cual no tenemos a nivel comercial. Tambien todo agricultor quisiera un arbol de manzana en su terreno a pesar de una baja elevación. Vista Bella y Anna son la respuesta. Vista Bella es una introducción hecha en 1968, producida por el profesor L. Fredric Hough de la Universidad de Rutgers en New Jersey, Estados Unidos. Vista Bella madura a finales de julio, es roja, con bastante aroma, carne blanca veteada de rojo. Se cree que tendra un buen futuro aunque hasta ahora solamente se sabe que produce bien a 2,270 m. (7,500 pies). Se esta propagando y será probada en diferentes alturas para poder establecer su valor comercial en toda la zona. Anna, de Israel, fue introducida por el profesor Ralph Sharpe de Florida. Los injertos originales fueron sembrados por Arturo Falla C. detras del beneficio de cafe de la Finca San Sebastian a 1,500 m. (5,000 pies). Esta es similar en forma a Delicious, verde con un cachete rojo, de carne blanca de excelente abor y aroma. Su importancia, además de ser una manzana fina, estriba en que parece ser adaptable a alturas donde no se ha cultivado la manzana. A 1,500 m. comenzo a producir a los dos años de injertado. Ahora se esta observando a 2,270 m. (7,500 pies). Entre las variedades de propagación limitada tenemos Gravenstein, Yellow Bell Flower y Permain. En general la propagación es lenta

debido a la falta de patrones.

Los patrones de manzano siguen siendo tema de discusión. A nivel comercial contamos con el patrón criollo. Estos vienen de viejos árboles descendientes de manzanos venidos de Europa. Su propagación es por medio de vástagos o esquejes. De las dos clases criollas el mejor se conoce como Huitan. Su formación de raices es rápido y forma buenos árboles injertados. La clasificación de los dos tipos no se ha hecho y la variación en calidad es un problema. Tambien se han tenido problemas de pudrición cuyo origen es el vástago del arbol viejo. La producción de patrones de semilla hasta ahora comienza en Quezaltenango. Se esta usando la manzana llamada de "Hierro". El trabajo de Susano Reyes es de importancia porque al fin hay alguien que esta germinando semillas. Los patrones Malling Merton fueron introducidos por Jorge Benitez y se han multiplicado en la zona de Quezaltenango. Se ha visto claramente que son resistentes al Pulgón Lanígero, Eriosoma lanigerum, pero presentan una serie de problemas para el agricultor. Los injertos sobre Malling Merton desarrollan lentamente. Esto se debe en gran parte a la falta de riego en los meses de febrero a mayo. Con riego el desarrollo es mayor pero la formación es de árboles mas enanos comparados a los que crecen en climas mas frios. En su poda de formación son exigentes y de no

tener la experiencia necesaria se les induce facilmente a que broten unicamente en la parte inferior del tronco sin que desarrollen las ramas mas altas. El desarrollo lento tiene como resultado ramas de pequeño diametro, las cuales deben ser apuntaladas al fructificar. Al no apuntalar se pierde un número considerable de ramas. Su uso comercial no se puede recomendar, se sabe que el clima y el tipo de suelo son suficientes para variar completamente su comportamiento. Por ahora no se tienen datos relacionados directamente con clima y suelo. Su uso experimental, para jardines y pruebas de variedades debe continuar. Estos fueron introducidos por el Pulgón Lanígero pero el control químico es mas factible y menos problemático en nuestro medio. El Dr. Harold B. Tukey en su correspondencia con nosotros ha sido muy enfático con respecto a las exigencias culturales de los Malling Merton. El ha recomendado realizar un programa experimental que no deje dudas sobre su comportamiento y exigencias culturales. Cabe agregar que en muy pocos casos estos patrones han recibido en Guatemala la atención que son la clave del éxito.

En peras la introducción de variedades y patrones ha sido fructífera. Ayres, del sur de los Estados Unidos es una híbrida que produce bien a 2,120 m. (7,000 pies). Por ahora debe ser sembrada a esa altura.

Se estan haciendo pruebas para conocer su zona adecuada. Se cree que a mayor altura tendra exito, a menor altura probablemente no de resultado debido a su sangre europea.

Entre las variedades de pera venidas de Estados Unidos y Europa hay una gran confusión. Se esta trabajando en su clasificación. Por estos trabajos se ha observado que Bartlett no produce abajo de los 2,425 m. (8,000 pies), su desarrollo es muy lento y la producción de fruta muy baja e irregular. Las peras de Tennesse, nuevas híbridas, prometen y se estan observando en diferentes alturas. De estas la mas prometedora es Mericourt. Por ahora se estan propagando varias variedades, entre ellas, Kieffer, Pineapple, Hood, Baldwin y Orient.

El problema mas grande en peras ha sido el patrón, ahora parece estar resuelto. La Manzanilla, Crataegus mexicana, (C. stipulosa, C. pubescens) es el patrón mas usado. La manzanilla aunque muy resistente a la sequía y tierras pobres no es adecuada. Es necesario sembrarla en lugar definitivo para injertarla tres años despues. Al lograrse el injerto comienza un desarrollo dispar y eventualmente se forma el Pie de Elefante. Las pruebas de pera francesa como patrón no han tenido éxito. Parece que su requerimiento de frio es muy alto y peras híbridas al ser injertadas no brotan despues

de la primera temporada de crecimiento. Podría ser que el patrón le trasmitiera el requerimiento de frio al injerto. La introducción de Pyrus calleryana hecha hace varios años es un éxito. Este patrón se sembro en Uyuca, Honduras hace veinte años y hasta la fecha el comportamiento es bueno. Calleryana se ha sembrado en considerables cantidades a 2,120 m. (7,000 pies) y se esta observando con diferentes variedades a 2,270 m. (7,500 pies). Siembras hechas en 1971 comienzan a tener las primeras frutas. El crecimiento de varias variedades es vigoroso, pero es necesario probar otras variedades en diferentes alturas. Por ahora se puede decir que el patrón de pera para Guatemala es Pyrus calleryana.

Durante estos años se ha visto claramente que las variaciones en comportamiento de las diferentes variedades, debido a los micro-climas, son muy marcadas. Para llegar a tener prácticas culturales adecuadas es necesario estudiar cada situación. En este campo queda mucho que hacer. A 2,425 m. (8,000 pies) debemos saber si lo indicado es una poda leve para obtener buena fructificación con dos floraciones. A menor altura la poda debe conducir a la formación de yemas florales y a evitar la formación de follaje excesivo que cierra los arboles. En el control de plagas los productos químicos no deben interferir con la floración para lograr buena poleni-

zación. Las aplicaciones de fertilizantes deben de ser en niveles adecuados para que los árboles aprovechen los nutrientes al máximo y la perdida por las fuertes lluvias sea mínima. La mejor epoca para aplicar fertilizantes sería aquella en que los arboles tienen un crecimiento vegetativo normal y entran al período de latencia sin problemas. Estas observaciones indican que aunque se han resuelto problemas basicos quedan por resolver algunos que pueden garantizar el éxito de la producción comercial de manzanas y peras en el Altiplano de Guatemala.

THE HOME OF "MARIA,"
HEROINE OF SOUTH AMERICA'S GREATEST NOVEL.

Wilson Popenoe,
Agricultural Explorer for the United States
Department of Agriculture.

It is generally conceded that "Maria," by Jorge Isaacs, is the greatest novel yet produced by Latin America. This distinction is due not more to the fact that it is a poignantly sweet story of romantic love, done by a master hand, than to the delightful descriptions which it contains of life in the Cauca Valley of Colombia about the middle of the last century. The vivid descriptions of Caucan scenery, of the simple pleasures of the countryfolk, and of the daily duties of a Colombian farm, offer abundant proof of the literary genius of South America's greatest novelist.

To me, the story loses much of its charm when translated into English. Perhaps it is because our language does not lend itself so well as does the Spanish to the fine portrayal of romantic feeling; - perhaps it is because the work gains much of its unique flavor from the abundant use of Caucan colloquialisms which do not permit of faithful translation.

If I am correct in believing that the English version is greatly inferior to the original Spanish in literary merit, it is easy to understand why the book has not become as popular in North America as it is throughout the Spanish-speaking portions of our hemisphere. When the visitor to Colombia, Ecuador, Peru, or any one of a dozen other Latin American republics falls to discussing literature with his newly-made Latin acquaintances, some one is almost certain to inquire, "Have you read 'Maria?'" Up to the present, I have failed to encounter a single educated Latin American who has not done so, and it seems to be the general custom to read it during early youth, - the most impressionable period of one's life. The tragic ending of the story, as well as the tensely dramatic scenes of one or two of the earlier chapters, stir the emotions to their very depths, and leave imperishable memories.

The principal characters are two, Efraim (who is none other than the author himself) and his cousin, Maria. Efraim's father was an English Jew, who came to the Cauca Valley from Jamaica, after having married the daughter of a Spanish sea-captain and embraced the Christian religion. Maria was the daughter of Efraim's uncle, Solomon, and had been

left an orphan while still a baby. It had been one of Solomon's last requests that his brother should take the child and bring her up as a member of his own family.

Efraim and his cousin Maria were thus thrown together during childhood days upon the farm in the Cauca Valley, which was later the scene of the most tragic portion of the romance. While still a child, Efraim is sent away to school in Bogota, where he remains six years. When he returns he has reached young manhood, and Maria is in the full bloom of early youth. Efraim finds himself in love with his cousin, and the ensuing months are the most happy and idyllic of his life.

A cloud, however, hangs upon the horizon. The family desires that Efraim go to London to complete his education, and the dreadful thought of separation disturbs both himself and Maria constantly. Very shortly, Maria suffers an attack of the hereditary disease which caused the death of her mother. The physician called from Cali to attend her prophesies at first that she will die from the complaint within a few years, and Efraim's despair is complete. Later, however, the girl's condition improves so markedly that Dr. Mayn retracts his prophecy. Efraim again sees his way clear to marry his adored cousin, but

still lives under the terror of two years of separation if he goes to Europe. Shortly, his father receives news that he has lost his fortune; Efraim seizes the opportunity to insist that the family give up the idea of spending a large sum upon his education, and urges his father to let him stay in the Cauca and assist in managing the farm. In this he is, of course, impelled more by his desire to remain by the side of Maria than by filial duty. The father, however, is obdurate, and the two lovers count the hours as the fateful day of separation approaches.

The most powerful scene in the novel is probably that in which Efraim takes leave of Maria, and starts upon his long journey to England. He rises after a sleepless night, and is met at the door by the faithful Juan Angel, his negro servant, who brings his spurs and zamarros (the picturesque garment, equivalent to the chaparrejos of our own Southwest, which is worn by Colombian horsemen). Donning these, he steps into the sala or parlor, which he finds unoccupied. He enters the next room, and meets his mother and his sister Emma. Both of them throw themselves upon his breast, and, sobbing, bid him Godspeed. Emma, divining his thoughts, motions toward the Oratorio (small chapel) within which Maria is awaiting him. He pushes open

the door. The young girl, who means more to him than life itself, is kneeling before a picture of the Virgin in front of which two candles are burning. Realizing his presence, she utters a faint cry, and without raising her head, gives him her hand. Falling to his knees, he covers it with kisses. As he rises to his feet again, Maria, fearful that he is already going to tear himself away, springs up and throws her arms about his neck. Her hair is streaming over her shoulders, and her face buried in his breast, she lifts one hand and points to the altar. Emma, who enters the chapel at this moment, takes the inanimate girl from Efraim's arms, and motions to him that he should leave. He obeys.

During his first year in London, he receives letters from Maria regularly by every mail. After this, they gradually become less frequent, and finally, a friend of the family comes to him,and breaks the news of Maria's failing health. All other remedies having failed, it is recommended by the doctor that Efraim return at once, in the hope that his presence may yet rescue her from the tomb. He starts immediately upon the long voyage to Colombia. Finally he lands at the port of Buenaventura, whence it is but a few days, by canoe and mule, to his beloved

Cauca Valley and Maria. He pushes ahead frantically, and finally reaches Cali, where he is told the family is awaiting him. He enters the house, and is met by Emma, dressed in mourning. He realizes instantly the import of this, and falls senseless upon a couch.

Weeks later, he visits the scene of the happiest days of his life, - the old home at the foot of the central cordillera of the Andes, twenty miles from Cali. Here he opens the cedar chest which belonged to Maria, and gazes lovingly upon the little keepsakes which she has left for him. The tale closes with a visit to the newly-made grave in the cemetery at Cali.

Such, in brief, is the plot of this story. Its tragic ending stamps it as quite different from the vast majority of romances which have been published during the past century. The Cauca valley, scene of the principal action, is one of the most beautiful regions in America; in fact, it comes nearer to fulfilling my ideal of a tropical paradise than any other spot I have ever seen. When one has gazed upon its glorious landscapes, and basked in the shade of bamboo beside one of its crystal-clear streams of cool water, he realizes that it is only natural that a literary genius like Jorge Isaacs, with the inspiration of such surroundings, should write a novel which would become the classic of Latin America.

To those familiar with the history of "Maria," it is well-known that a large part of the story is true. Efraim's account of his early life on the old farm at the foot of the central cordillera, together with the coming of his infant cousin, Maria, to live with the family and become a part of it, is, I am assured by those who live in the Cauca and are conversant with the matter, based upon fact. The later portions of the work, including Efraim's race with death from London to the Cauca, only to find upon reaching Cali that Maria had died two weeks previously, - all this part of the work, I am told (and I must confess that I derive much consolation from the knowledge) is fiction.

Many of the scenes protrayed in the book can be visited today, and will be recognized instantly by one who has read his "Maria" carefully. As the visitor to the Cauca crosses the western range of the Andes on the train from Buenaventura to Cali, his fellow passengers are certain to point out to him, upon the farther slope of the valley at the immediate foot of the central cordillera, a white speck, barely visible at this distance. This is "El Paraiso", the home of Jorge Isaacs, and the "Hacienda de la sierra" of the story. Below it is the superb Cauca flowing

in a series of wide curves through a valley ten to fifteen miles in width, whose level floor is a huge pasture in which the cattle are sometimes hidden from sight, so lush is the growth of Para grass on this fertile soil. Along the river is a fringe of cachimbo trees, whose shade protects the delicate cacao plants cultivated beneath them; in October and November these trees are gorgeous with their orange-scarlet flowers, and add a delightful touch of color to the scene.

In 1920 I had the good fortune to pass a week at the Hacienda "La Manuelita", as the guest of Mr. and Mrs. Charles Eder. This was formerly the "hacienda de abajo" (lower hacienda) of the Isaacs family, and is mentioned several times in the story of Maria. It is one of the prettiest spots in the Cauca, and coincides in every respect with the descriptions of it in the book, even to the "white gateway which, at seventy yards from the house, gave entrance to the patio."

In company with Doris Eder, I visited the "hacienda de la sierra," altogether the most idyllic spot I have ever seen. Above the front door has been placed, in recent years, the inscription "Aqui cantó y lloró Jorge Isaacs" (Here sang and wept George Isaacs).

The various rooms described in the story, and all of the surroundings, are recognizable immediately; the place is, however, rapidly falling into a state of lamentable decay. The inhabitants of Cali talk of erecting a monument to Jorge Isaacs: what tribute could be more fitting than the preservation of his home, in the precise condition described in the pages of his immortal novel?

On the fly leaf of my "Maria," I find the following note, written on the day I visited "El Paraiso," "Azucenas still bloom in the abandoned garden, but the roses are gone, the house practically abandoned, and the patio grown up to weeds. ~~But~~ The natural setting could not be more beautiful, - the Cauca Valley spread out below, with the western cordillera in the hazy distance, the forest-covered mountains rising immediately to the rear, and, a hundred feet to the south, a rushing, crystal-clear brook on its way to join the Cauca River."

He who walks in the abandoned garden can gather flowers of the azucena de la montana (wild lily), perhaps from the descendants of the very plants which Maria so tenderly cared for during Efraim's exile in London and whose petals she was wont to send him in every letter. To one of botanical leanings it is of interest to know that this azucena is a species of Crinum.

Close by the house, at the farther side of the garden, is the tiny pool known to people of the Cauca as "Maria's bath." In very recent years a small bath-house has been erected beside it. Upon the limpid waters of the pool Maria was wont to scatter rose-petals on those days when Efraim, returning from the forest or from a long ride across the valley, refreshed himself with a plunge.

To one who has read the story, all of these scenes are filled with sad romance, and hallowed with the memories of one of the sweetest characters ever portrayed by the hand of man.

LE CERISIER SAUVAGE DE LA GUATEMALA.

Wilson Popenoe
Agricultural Explorer, United States Department of Agriculture.

Dans les hauts plateaux de la Guatemala, á les elevations de 1300 á 3000 metres, se trouve, sauvage et cultivé, un fruit qui possede plus que l'interet ordinaire á ceux qui s'occupent de la cultivation et l'amelioration des fruits tropicales et subtropicales. Je parle du cerisier sauvage, Prunus salicifolia HBK[1], appelé cerezo (le fruit cereza) par les habitantes de la Guatemala qui parlent l'Espagnol, capulín par les Indiens Cakchiquel, et tup par les Quiché. Quoique ce n'est pas une espece vraiement tropicale,--c'est á dire, pas adaptée á les regions les plus chauds des tropiques,--c'est effectivement subtropicale par sa nature, et peut etre reussirait dans les regions meridionales des Etats-Unis, le littoral de la Mediterranee, l'Inde septentrionale, le sud du Bresil et de l'Afrique, aussi bien que dans les tropiques elles-memes, lorsqu'on le plante a une elevation d'un ou deux mille metres. Actuellement, dans son etat sauvage, pas amelioré, le fruit est de bonne qualité, et il semblerait qu'avec un peu d'attention au part des horticulteurs il peut devenir une addition d'un grand valeur á les plantes qui peuvent etre cultivées dans les pays tropicales et subtropicales.

Pour juger du climat a lequel cette espece est adaptée on n'a que remarquer l'Antigua, Guatemala (elevation 1700 metres) ou elle se trouve cultivée dans les jardins comme un fruit de choix. Cachée dans une petite vallee, Amtigua est abritée d'une coté par la grande massif du Volcan de Agua, et de l'autre par

les monts jumeaux du Volcan de Acatenango et le Volcan de Fuego. Au bout nord de la vallee s'elevent des hautes collines, et au sud, il y a une aperture penetrée par le vent du mer Pacifique, apportant souvent des grosses vagues. La terre de la vallee est baisse, riche, sableuse, incontestablement d'origine volcanique, tres retentive d'humidité, et adaptée a plusieures cultures du champ aussi bien que du jardin. La café est la recolte principale de la vallee, mais sur les bordes les indigenes bechent leurs champs de mais, des haricots, et leurs jardins de potages. La lucerne (Medicago sativa L.) est cultivée dans la vallee, et dans les cours des habitantes croissent beaucoup d'arbres fruitiers, surtout l'ahuacatier (Persea americana Mill., P. gratissima Gaertn.),le jocotier (Spondias purpurea L.), l'orangier, l'anonier (Anona Cherimolia Mill.), le pechier, l'injertoier (Achradelpha viridis O.F.Cook) et plus rarement le manguier, qui, probablement a cause du manque de chaleur ne depasse guere une hauteur de 7 or 8 metres. Malgré son elevation de 1700 metres, la region n'est pas froid, ce que temoigne la culture repandu du cafeier, et de plus, l'existemce des magnifiques palmiers royales (Oreodoxa regia HBK), qui atteignent 15 metres. La protection donné par les montagnes au nord, est et oest, avec le vent chaud qui entre de la Pacifique au sud de la vallee probablement font en grande partie que le climat d'Antigua aié un douceur si remarkable pendant toute l'annee.

Il ne fait rarement froid ni chaud. Les observations meteorologiques n'existent pas, mais le temperature tomberait a peine dessous de 10 C., ou se leve au dessus de 28 C. Les mois plus froids sont ceux de novembre jusqu'a janvier ou fevrier, gt

les plus chauds sont avril et mai. La pluie n'est pas distribuée egalement parmi les douze mois. Le plupart tombe entre le 15 mai et le 10 octobre; les mois de novembre a avril inclusives etant presque sans pluie. Il n'y a pas des observations sur la quantite annuelle de precipitation, mais dans la Ville de Guatemala, a la meme elevation et loin de 25 km, on attend une chute de 125 cm. Parfois on desseche avec 90 cm, ou bien on est inonde par 165 cm.

C'est dans un tel milieu que reusse le Prunus salicifolia. S'il reussirait a les elevations plus faibles dans les tropiques ou la chaleur est tres severe, reste á voir. Qu'il est rustique dans les endroits plus froids que l'Antigua est bien sur, parce que dans les jardins pres de Tecpan (2300 metres) et Totonicapan (2600 metres), a l'oest de la Ville de Guatemala, on le trouve souvent. Totonicapan est beaucoup trop froid pour les orangiers.

Comme vue de l'ordinaire sur les hauts plateaux, cette espece est un arbre droit, un peu etroit quelque fois, atteignant un hauteur de 10 metres, le tige epaix quelquefois d'un metre et l'ecorce grisatre et rude. Les jeunes tiges sont couverts a poivre et sel des petits lenticelles gris. Les feuilles attachés a petioles minces de 2 cm, sont ordinairement 12 cm de longeur et 3 a 4 cm d'epaisseur, a la partie la plus epaisse, lanceolées de forme, avec le bout long et etroit. La cote de dessus est verdâtre, l'endessous glauque, le bord est mangé de petits dents. Les fleurs, qui s'epanouissent de janvier a mai, sont blanches, larges d'a peu pres d'une cm., tres nombreuses sur les petites racimes, de 5 a 10 cm de longeur. Quinze ou 20 fruits d eveloppent sur une suele racime, mais plusieurs tombent avant maturite, ainsi

que 2 a 5 fruits murs peuvent rester sur chaque racime. La recolte en Guatemala est de mai a septembre, un temps notablement long. Les fruits murs sont un peu oblate en forme, et de 1-1/2 cm en diametre, tombent facilement des pedicelles, laissant toujours le vert 5-dents calice sur le pedicelle. Le fruit est d'un couleur pourpre. Le peau est mince et tendre mais assez fort pour que le fruit ne s'avarie pas facilement, et la chair est verdatre, pleine de jus. Le gout est sucre, rapellant cel des cerises Bigarreau, avec un peu d'amertume dans le peau. Le graine est un peu trop grand; c'est preqque du meme grandeur que ceux des cerises cultives du nord. La culture, sans doute, ferait grandir la volume du chair sans grandir la graine. Il faut se rappeler que les arbres fruitiers "cultives" de la Guatemala seulement poussent dans les cours, sans recevoir point les soins qu'on comprend par "cultivation" chez les horticulteurs Europeens et Nord Americains. Le taille ne se pratique jamais, les envrais ne son appliques point; la terre n'est pas laboree, et l'eau n'est pas donne aux plantes pendent la longue saison sans pluie.

Bon a manger frais, cette cerise peut etre consomme aussi bien d'autres facons, en compote, ou en conserve, par example. En Guatemala, le plus frequemment on le mange crut, ou en conserve sucre. Naturellement, on ne peut dire que cette cerise vaut quelquesunes de bonnes varietés du Nord, qui sont les produits de siecles de selection et propagation vegetative, mais il faut admettre que c'est un fruit remarkable, vu que c'est la produit de semes seulement, sans ayant jamais amelioré rationellement. Un fois dans les mains des horticulteurs intelligents d'un

pays convenable, on peut attendre apres quelques generations de selection qu'il doit devenir un fruit digne de prendre place avec ses parents delicieus, les cerises du Nord.

[1] L.H.Bailey (Enc. Hort. V, p. 2842) croit que P. salicifolia HBK est une espece de l'Amerique du Sud, et que celle de l'Amerique Centrale est P. Capollin Koehne (P. Capuli Cav., Cerasus Capollin DC.). Il remarque que les deux especes sont peu differentes, l'une de l'autre. Elles appartiennent a la groupe P. serotina, la cerise noire sauvage des Etats-Unis.

THE BACKGROUND OF TROPICAL AMERICAN FRUIT CULTURE

Wilson Popenoe

Gonzalo Fernandez de Oviedo, in his "Sumario de la Natural Historia de las Indias" published at Toledo in 1526 -- and later, in his much more extensive "Historia General y Natural de las Indias" gave us much information regarding the indigenous fruit trees of tropical America, as well as some of those brought from Spain by the Conquistadores and their followers. Oviedo gives us fairly detailed descriptions of such American fruits as the Mamey (Mammea americana), the Guanabano (Annona muricata), the guavas, the papaya, the avocado, and the pineapple. And he tells us that even before the year 1526 oranges (both sour and sweet) as well as other citrus fruits, the banana (for which he uses the Spanish name platano), melons and many vegetables from Spain were being grown on the Islands and the mainland.

Even earlier than in Oviedo's Sumario, we have a good description of the avocado, given us by the Bachiller Enciso in his Suma de Geografia published at Sevilla in 1519. It is of interest to note that Enciso's little book, which is now, of course, extremely rare, is considered to have been the first one published about the New World. Enciso, when referred to in subsequent early writings, is always termed the Bachiller or "Bachelor" which I suspect means that he was a Bachelor of Laws, and probably indicates that such men were as rare in the Spain of those days as Doctors of Philosophy are in the United States at the present time. Perhaps even more rare. "The Bachiller" was with the navigator Alonso de Ojeda, coasting along the mainland, then known as Tierra Firme, when he went ashore to a small valley which had its origin in the Sierra Nevada of Santa Marta, and there ate his first avocado, which he characterized as "marvelous". I have tried to locate

his little valley by going to that region myself, but was never sure I had found it---there are so many small valleys opening onto the coast, not far from the present port of Santa Marta in Colombia. It is interesting to note that in those days avocados grew only on the mainland; they were not known in the West Indies until taken there by the Spaniards at an unknown date.

The banana was one of the very first fruits to be transplanted from Europe to the New World. We have the great Oviedo to thank for the story. He wrote that Fray Tomas de Berlanga took the "platano" from the Canary Islands to Santo Domingo in 1516. I have twice visited Berlanga de Duero, north of Madrid, where Fray Tomas was born and later died after having served his church as the fourth Bishop of Panama, and having been the discoverer of the Galapagos Islands. He was a great lover of everything connected with Natural History. From Panama he took home to his church in Berlanga a stuffed alligator, which still hangs after more than four centuries, over one of the doors.

Of what variety was this banana, which he took to the New World? Our investigations have convinced me that it was the one you see in dooryards here in Gainesville. In Florida it is often called the Orinoco or Horse banana.

The great historian Bernal Diaz del Castello, who was a companion of Cortes at the Conquest of Mexico, claims in his "Verdadera Historia" that he was the one who first planted oranges on the American continent. He says he planted some seeds on what is now the Isthmus of Tehuantepec, when he was with Cortes on the famous march from Mexico City to the Gulf of Honduras. Where did he get his seeds? Most probably from Cuba, it would seem. But what kind of oranges were they? Most probably, the sour or Seville orange.

I have long said that a Spaniard, to live happily, must have three things, viz., wheat bread, olive oil, and wine. In one of his letters to the Emperor Charles

the First, known as Carlos Quinto (Charles the Fifth), in certain regions that he governed, Cortes wrote, "And your Majesty should let no ship sail for these your new lands without bringing seeds of those crops we knew so well in Spain, and which we miss so keenly here." Wheat early became established in tropical America. Olives and grapes would almost certainly have been two others to receive attention. But these two have never been grown successfully in the purely tropical regions, the olive for lack of sufficently cold weather, the European grape (Vitis vinifera) because of various diseases of fungous origin.

Only a few years ago we had occasion to see the most recent attempt to grow successfully the olive tree in this part of the world. Literally hundreds of thousands of young plants from Portugal were sold to government agencies and private planters. Almost everywhere these trees have vegetated beautifully but like others planted before then, have not borne good crops anywhere between central Mexico and Central Peru.

European grapes have produced good crops when aided by the warmth and dryness of patios in private homes, but there are few if any successful vineyards of commercial size, again between Mexico and Peru.

During the 17th century and later, the Spanish missionary priests displayed laudable zeal in carrying useful fruits from one part of the New World to another. We have reason to believe that it was these horticultural pioneers who took the cherimoya from the Andes to Mexico, and the hardy Mexican avocados to the mountain valleys of Ecuador and perhaps even to Chile. In relatively recent times (the XVIII century) the followers of the great Junipero Serra laid the foundations of modern California fruit culture by taking to their new missions the olive, the grape and the fig from northern Mexico.

Another interesting note about avocados is found in the "Comentarios Reales" of Garcilaso de la Vega, who took part in Pizarro's conquest of Peru and shortly

afterwards married one of the Inca princesses. Carcilaso wrote that one of the last great Incas, Huayna Capac, took the avocado from Ecuador to the warm valleys near Cuzco. These would surely have been avocados of the West Indian race, as we now call it, bacuase this was the only one known in South America at that time. Since Huayna Capac found this fruit in the territory of the Palta tribe of Indians in southern Ecuador, the Peruvians gave it the name palta, which is still used in Peru, Chile and Argentina, instead of the Mexican name ahuacatl, which the Spaniards adopted as aguacate.

While we are discussing avocados, I would like to set forth my views regarding the origins of the three well-defined races which were recognized as early as 1653 -- I believe it was -- by Padre Bernabe Cobo. We will start at the lowest altitudinal level and work upward.

The West Indian race, which would more properly be called the South American, since it was not grown in the West Indies in pre-Conquest days, probably represents a geographical form of Persea americana which is indigenous in southern Costa Rica, Panama, Colombia and possibly adjacent regions. It seems not to have been known in other parts of South America.

The Guatemalan race, I have come to believe, is derived from a wild tree still to be seen in the mountains of Guatemala, always at high elevations. It goes up to more than 9000 feet and does not seem to have been known in Mexico before the Conquest except, perhaps, in mountainous areas close to Gautemala.

The Mexican race probably still exists as an indigenous tree at moderately high elevations around the Volcano Orizaba and in other parts of Central Mexico. Before the Conquest it does not seem to have been cultivated -- or even known -- outside of the highlands. While it has been considered a distinct species of Persea by some botanists, the present tendency is to classify all three races as nothing more than geographical forms of one and the same species, P. americana, of which the synonym P. gratissima continues to appear in numerous horticultural publications.

About 1700 the Portuguese took the mango from India to Brazil. The long delay in achieving the introduction of so valuable a fruit may quite possibly be accounted for by the fact that transportation was slow in those days, and every tropical horticulturist knows that mango seeds do not long retain their viability. Young trees would also have been difficult to keep alive on the long trip from Goa to Bahia or Rio de Janeiro.

But, once established in the Americas, the mango spread rapidly from one region to another, until it became so abundant in Jamaica and elsewhere, as almost to assume the appearance of a native species.

These first mangos appear to have been seedlings in every case, and many years passed before a new impetus was given to mango growing through the introduction of fine grafted varieties, which the British finally succeeded in bringing from India. The French also were busy getting fine mangos for their West Indian colonies, as witness the story of the capture by Admiral Rodney of a French ship bringing, among other things, mangos from the French settlement in the South Pacific -- probably Reunion and Mauritius. The good Admiral sent them, along with other fruit trees obtained in the same way, to the garden of Hinton East in Jamaica.

But the French kept on trying, with the result that they eventually established in Martinique and Guadeloupe a number of mango varieties, quite different from the grafted mangos the British were bringing from India. The British and French varieties have given us, directly or indirectly (through locally produced seedlings) practically all of the splendid mangos now cultivated in Florida.

There is another and very distinct race of mangos, however, the Philippine (known in Mexico as Manila, in Cuba as Filipino) which produces fruits of fine quality, almost free from fiber. A few of these have taken part in the development of the Florida mango industry.

And now, as a final touch, I want to mention what I suppose has been the best-publicized tropical fruit introduction of all time. Most of you, I imagine, have already said to yourselves, "Ah, the story of Captain Bligh and the bread fruit." You are right.

Having heard so much about the bread fruit as one of the most important food crops of the South Pacific, the British came to feel that it might be an excellent thing for the slaves in their West Indian colonies. So Captain Bligh set sail in the good ship "Bounty" and went to Tahiti. But it appears he stayed there a bit too long. When they sailed with their precious cargo, most of the crew had acquired a liking for the easy life, the balmy climate and perhaps more especially for the Tahitian girls. When far out to sea, they put the Captain and 18 loyal followers in a small open boat and told them to look out for themselves. After sailing some 3,00 miles the party reached civilization -- the island of Timor in this case -- while the mutinous crew returned to Tahiti in the Bounty, picked up some willing passengers, apparently, and sailed to Pitcairn island, where they settled down to enjoy an idyllic existence.

The Captain, not to be discouraged, returned to England, outfitted another ship, and in the year 1792 sailed back to the South Pacific, where 1200 bread fruit trees were loaded on board. Eventually these were successfully planted in the West Indies, where they found soil and climate to their liking. They produced plenty of fruit, but the slaves seemed to prefer plantains, perhaps because you didn't have to wait so long for a crop. Bread fruit, though it became popular and is so to this day, never attained the economic importance the British had hoped for and expected.

[1960-1962]

ESCUELA AGRICOLA PANAMERICANA

APARTADO 93

TEGUCIGALPA, HONDURAS
CENTRO AMERICA

Memorandum regarding the famous marimba
"LA ESTERLINA"

This marimba was built about 15 years ago by Don Lorenzo, ~~hhere~~ in Antigua, which might almost be called the home of the marimba in Guatemala. Don Lorenzo has been building marimbas for just about 50 years; when better ones are built, he will build them. Fancier and more professional marimbas are now built in Guatemala, the seven-man size, and they cost as much as $500 or even more. but "La Esterlina" is typical of the good Guatemalan marimba of the back country. When we bought it, this instrument was in the village of Parramos, some 15 miles from Antigua, and if you had one dollar for every Indian who has danced its music you could retire and go to Paris to live.

You would not buy a new violin if you could get a Stradivarius, and you should not buy a new marimba. This one is just properly mellowed up. But you will have to keep it in condition, and you will have to remember that a marimba is a very delicate instrument which reacts to changes in temperature and humidity. Once in a while it may have to be tuned; you do this by cutting off a bit of wood from the underside of a key, or sticking on a bit of chewing gum as the case may bequire. Not so expensive as tuning a piano. The major proble however, is keeping the sounding boxes in condition. Dont let them get full of dust. Even if kept clean, the membranes over the holes toward the bottoms will need replacing from time to time. These membranes traditionally must be made the gut of a shoat, but I suspect something else might do. It is also traditional that they must be fastened in place with the wax made by Guatemalan wild bees. No ~~other~~ bees make the right kind of wax. But you might try, using the wax of Apis mellifica L. with something added to soften it a trifle.

It is not at all hard to dismantle a marimba. If and when the cords which hold the keys in place have to be renewed, remember that the cord must be soft - check with the cord on the instrument as at present.

The "vaquetas" or hammers must correspond to the proper parts of the keyboard. There are no vaquetas for the four upper notes because these notes are never used; they could be used with very small and hard hammers but I think they are placed just to complete an octave or something of that sort. This marimba should be played by four men, and your professional marimbistas at the University will show how the hammers are to be handled - not one in each hand.

Now here is the way the account stands : Cost of the marimba at Parramos, $85, plus $6 for hauling it to Antigua. Charge by the best professional in Antigua for tuning it, and putting it in good condition, $10. Expense of white cypress (Cupressus benthami) for boxing it, $14 - beautiful wood, for goodness sake dont burn it in your fireplace. No charge for the carpenter's work, he is on my payroll; no charge for the fertilizer bags to protect the keyboard, compliments of Wilson and Toomer. Hauling to Guatemala City, $6; airplane transportation Guatemala City to Miami, $28 (pretty cheap) but would have been cheaper if they had charged by weight instead of volume; they learned this trick from the steamship companies. Add up these items and give Hugh a check which he will doubtless spend before I get up there; I cant do the addition because us Maya Indians can only count as follows: Five fingers on left hand, five on right hand, five ones on left foot and five on right; that makes twenty and beyond that it is all higher mathematics which we cant handle.

ANTECEDENTES HUMANOS DE LANCETILLA

por

DOROTHY Y WILSON POPENOE

Cristobal de Olid, veterano de la árdua campaña en Méjico, la cual terminó con la caida del imperio de Moctezuma, fué despachado por Cortés a tomar a su cargo la conquista de Honduras. De acuerdo con el historiador Herrera, la expedición de Olid ancló en la hoy conocida bahia de Tela el 4 de Abril de 1524--aunque el padre Juarros, escribiendo muchó más tarde, cree que fué un año antes de aquella fecha. Tantas cosas sucedieron--dice ingénuamente el buen padre-entre la llegada de Olid y la famosa marcha de Cortés al Golfo de Honduras en 1526, que no podrían estar condensadas en dos años.

Los españoles que vinieron con Olid formaron una colonia a la que llamaron "Triunfo de la Cruz" para conmemorar su arribo en el día de la Santa Cruz. Estaba situada no lejos del puerto de Tela de nuestros días en la pequeña punta que todavía lleva el nombre de Triunfo.

Pronto llegaron noticias de Méjico de que Olid no era leal a su jefe. Cortés despachó apresuradamente a Francisco de las Casas a someter al renegado. Hubo una batalla naval en la bahia de Tela. Olid envió dos barcos y uno fué hundido por Casas quien ya estaba para obtener la victoria cuando vino un huracán y durante la noche se ahogaron cuarenta de sus hombres. Entre los pocos sobrevivientes quedó Casas quien pudo al fin ganar la orilla y fué recibido generosamente por Olid.

Tuvo lugar entonces un período de forzada cortesia por ambas partes. Los Españoles se dirigieron tierra adentro y se establecieron provisionalmente en la indígena ciudad de Naco. Una noche Casas y un tercer conquistador llamado Gil Gonzales Dávila (quien también arribó a Honduras acariciando la idea de conquistarla para sí), estaban comiendo con Olid, de quien indudablemente eran prisioneron, aunque fuesen trata-

dos con gran consideración. A una señal convenida uno de los hombres de Dávila se abalanzó sobre Olid dándole un tirón en la cabeza hacia atrás, mientras Casas lo agarró por la barba y le dió un navajazo en la garganta. El gran guerrero tuvo suficiente fuerza y sangre fría para pelear su libertad. Debilitado por la gran pérdida de sangre buscó refugio en la choza de un indio; pero fué descubierto por haber enviado por un sacerdote para que le administrara los Sanbamentos. Entonces fué arrastrado a la plza más muerto que vivo-ahí tuvo lugar una prueba burlesca y luego fué descabezado a la vista de sus partidarios ninguno de los cuales se atrevió a levantar una mano para auxiliarlo.

Se fundó Trujillo. Triunfo de la Cruz fué abandonado y olvidado. No existe ni un vestigio que marque el sitio de la primera colonia europea en el territorio que formaría más tarde la Republica de Honduras. El cádaver de Cristobal de Olid reposa en una tumba desconocida.

Los primeros días de la conquista y colonización fueron duros así como lo eran en cualquiera parte del Nuevo Mundo. Lopez de Gómara, describiendo la vida hondureña en su tiempo (él murio 1560), refiere humorísticamnete, que "Diego Lopez de Salceda vino como gobernador y sus hombres le metieron hierbas en su pastel." Vino después Vasco de Herrera y lo arrastraron por las calles después de haberlo apuñalado. Entonces llegó Diego de Albitez y le "metieron hierbas en su pastel."

Poco a poco fué el país sometido al yugo de Castilla-poco a poco fué formado el imperio colonial que por tres siglos dió testimonio de la industria, el genio y el valor personal de la wraza española. Por cruel que haya sido, su crueldad fué propia de aquellos tiempos.

A pesar de vivir en mal clima y en condiciones difíciles, los colonizadores tuvieron tiempo y energia para hacer constar en sus escritos mucho de lo que vieron y oyeron dejándonos por consiguiente preciosos relatos de las cosas del nuevo mundo como eran antes de que Colón uniera los dos hemisferios. Pero estos relatos no abarcan más allá de la Conquista;

los habitantes de las Américas carecían en esos tiempos de medios adecuados para conservar su historia y por consiguiente daban a los españoles escasa información relativa a las generaciones anteriores. Quedó para la Aéqueología reconstruir en parte la historia de la raza de América.

Triunfo de la Cruz fué la primera colonia européa en Honduras y Lancetilla es el punto más cercano de donde se han recogido restos arqueológicos en cantidad suficiente para estudiarlos con inteligencia.

ACTIVIDADES MODERNAS EN EL VALLE DE LANCETILLA

La Tela R.R.Co. estableció hace cinco años en la parte final y elevada del valle de Lancetilla a tres millas del mar una estación Experimental de Agricultura. El Lugar escogido está situado al pié de las montañas y extiéndese hacia arriba sobre una pequeña falda de terreno. A lo largo de uno de sus lados corre el rio Tela sobre un lecho pedregoso rumbo al mar.

Se descombró un terreno de varios acres el que fué preparado para criaderos de plantas. Durante este proceso fué encontrado un baluarte a propósito para ser usado como estación metereológica. Su altura era de cuatro piés sobre la superficie por cuarenta de diámetros en la base. Al aplanar la superficie para colocar los intrumentos meterológicos fueron arrancados numerosos tiestos de barro pero no había entre ellos ninguno de imortancia arqueológica.

Mas, durante el primer año no pasó una semana en que los trabajadores del criadero dejaran de encontrar artefactos de interés. Pedazos de obsidiana, principalmente en forma de cuchillos, eran tan comunes que ya no llamaban la atención, asi como tampoco los tiestos que había por todas partes. Todos los ejemplares se encontraban a flor de tierra. Al hacer excavaciones para un camino, se hallaron pedazos de vasijas a dos pies de profundidad; pero es probable que el suelo no estuviera en su posicion original, dado que previamente existía otro camino cerca de este

mismo lugar.

ARQUEOLOGIA DE LANCETILLA

Etnográficamente el Valle de Lancetilla estaba situado entre los territorios de dos pueblos de cultura distinta. A pocas millas al Oeste estaban las grandes rutas de los comerciantes pre-colombinos y los territorios de varias tribus relativamente avanzados--el rico Valle del Ulua. Alfarería espléndidamente pintada, figuritas y pitos de barros son típicos de esta región, donde se sintió fuertemente la influencia Maya del Norte.

Por otra parte la región de los rios Paulaya y Sico, al Este de Lancetilla, recibió la vanguardia de la emigracion Chorotega. Las gentes de ésta raza, cuyo territorio se extendía con rumbo al Sur hasta Costa Rica, eran hábiles trabajadores de piedra, especializándose en gigantescas piedras de moler maíz, grandes jarros y otros objetos cincelados de grandes peñas sólidas. Eran menos diestros en trabajos finos de barro y en alfarería pintada.

La mayor parte de los artefactos hallados en Lancetilla son de piedra. Los trabajos de alfarería son casi de barro arenoso, ordinario, y mal horneado.

ARTEFACTOS DE PIEDRA

Un estudio de las piedras cinceladas nos revela el hecho de que se conocian al menos tres maneras distintas de transformar la materia cruda en la forma deseada.

La primera es un método que ha sido empleado por muchos pueblos primitivos, siendo caracteristico particularment de la Edad Paleológica, o sea la era del Primer Hombre Verdadero, según H.G.Wells. Las piedras frágiles como las de chispa, y en América, Obsidiana, fueron picadas y cepillas hasta traformarlas en objetos útiles.

El arte de picar pedernales requiera mucha destreza. Cualquiera

se convencería de ello si tratara de hacerlo. La delgadez, la finura de las puntas, y la delicadeza de las orillas bien curvadas es ciertamente un obra que reguiera no sólo ejecución perfecta sino exquisito gusto artistico.

Lanzas y flechas eran las armas del hombre de Lancetilla. No solamente le servían para defenderse de los enemigos que se precipitaban de los cerros a apoderarse de su fértil valle, sino también como medio de obtener comida.

Las florestas abundan aquí en caza. El hombre deslizabase descalzo entre los árboles, silenciosos como una sombra para arrojarse sobre al la indefensa presa y atravesarla con su aguda lanza. Las flechas eran más apropiadas para los pájaros; la chachalaca, el guangololo, y el paujil.

Para satisfacer sus necesidades domésticas, se hizo navajas de piedra porque el metal no estaba comprendido en su experiencia. Sus antecesores habían descubierto cierta piedra negra que llamamos obsidiana o sea vidrio volcánico de propiedades peculiares. Golpeamdo con un martillo alrededor de la parte superior de un bloque de este material podían hacer volar delgadas astillas filudas como hojas de navaja. Continuaban el proceso hasta que no quedaba nada de pieza obsidiana excepto una concha. Cuchillos fueron hechos igual manera. Sus usos deben haber sido incontables.

El arte de trabajar la piedra fué seguido por otro descubrimiento y este era el efesto producido al desbastar y alisar los artículos trabajados. Grandes piedras eran partidas y modeladas en vaos y tasas. Una piedra de molesr encontrada en Lancetilla fué hecha asi, y está muy desgastada por el uso. Su diseño adornado con una cabeza de animal recuerda los más bonitos ejemplares encontrados en la región Chorotega y del rio Negro.

El mismo método fué empleado en la fábrica de otros articulos. Las

hachas en forma de cuñas eran insertadas a través de un agujero en la punta de un palo grueso que les servía de mango. No era necesario amarrar las dos partes ya que la acción de martillar sevía de fuerza para que la piedra quedara mejor metida en el mango. Piedras esféricas fueron empleás como martillos. Los mangos de madera eran amarrados por medio de tiras del alguna fibra, enrollada en el hueco central de la piedra.

Todos los objetos descritos parecen más apropiados para hombres que para mujeres; que hay uno de ellos que parece más apropiados para uso de las últimas, Es una batea o aporreador que nos sugiere la idea de la ropa usada por aquellas gentes. Asi como el martillo, tiene un hueco al lado, del cual debe haber sido atada al palo que formaba el mango. La corteza inteier del árbol de higo después de haber sido puesta a ablandarse en el agua aporreada hasta obtener una especie de lámina de papel. Cortábase en la forma deseada y deapues era pintada y decorada en colores vegetales chillantes. Las pieles de animales salvajes también se usaban para ropa.

Algunos de los implementos de nuestra colección son posiblemente usados para limpiar cueros.

ORNAMENTOS Y JOYERIA

El ingenio demostrado por los fabricantes de implementos en los viejos tiempos ha superado el de los lapidarios. Su piedra mas preciada era el jadeita del cual se conocían muchas variedades. Era tambien la piedra sagrada, favorecida a menudo con significancia religiosa. Hay numerosas referencias sobre trabajos de jadeita en los escritos de los españoles. Herrera dice: "Habia en Honduras tres principales ídolos venerados en varios templos. Uno a cuatro leguas de Trujillo, otro en un pueblo a veinte leguas de distancia y el tercero en una isla a quince leguas de aquella ciudad. Todos tenian forma de mujer eran hechos de cierta piedra verde semejante al mármol y hacia ellos convergía la de-

voción de las gentes quienes les recomendaban todos sus asuntos.

Mineralógicamente hablando, el jade es de dos clases: nefrita o verdadero jade (un silicato de calcio y magnesia) y jadeita, un silicato de sodio y aluminio. El eminente petrologista Henry S. Washington refiriendose a los jades de America Central asegura que pertenecen al grupo general de jadeitas diferenciándose únicamente en dos particulares técnicos de los jadeitas de Burma (cuyo país es la fuente de jadeitas del viejo mundo.) Mr. Washington cree que los jadeitas trabajados por los habitantes indígenas de Centro America se derivaban principalmente de dos fuetes: una en Oaxaca o Guerrero, Mejico, y la otra en Guatemala.

Los jadeitas de Lancetilla representan formas puramente ornamentales como pendientes, cuentas y amuletos. Los agujeros que tienen las cuentas encierran aún otro método de trabajo. La punta de un intrumento (talvez una estaca dura,) era metida en arena primero y colocada despues en la piedra que se iba a taladrad. El instrumento era entonces frotado entre ambas palmas de las manos y este tedioso proceso podia continuar hasta que el objeto estaba taladrado de un lado. Entonces se repetía la operación al otro lado hasta abrir el agujero completo. Las formas de todas éstas cuentas dependían sin lugar a duda de la forma original de las piedras de donde se cortaban.

Una pequeña máscara de Lancetilla sugiere más al arte Maya que el Chorotega. La influencia Maya, o mejor dicho la influencia del Valle Ulúa se vé más claramente en el tipo de cacharros encontrados aqui por pobres que sean los ejemplares. Pitos en forma de pajaritos, figuras de cabezas y máscaras, ambas huecas y sólidas, son idénticas a las encontradas a lo largo del Ulúa. Estos pequeños ídolos de barro eran usados mayormente como dioses familiares; muchos de ellos representan mujeres, emblemas indudablemente de fertilidad. Donde quiera que estuvieran, ya en los campos para fomentar las buenas cosechas, ora en los ho-

gares deseosos de abundante prole o venerados apant

gares deseosos de abundante prole o venerados aparte en pequeños templos, prevalecía la costumbre de quemar incienso entre ellos tal como ahora se encienden velas ante los santos de los paises católicos.

Una cabeza de indio parece que ha sido parte de un incensario del tipo conocido de los últimos Mayas y encontrado ocasionalmente en el Valle Ulúa, con más frecuencia en Guatemala, en Honduras Británica y al Sur de Yucatán.

De todas las piezas de barro pintado que encontramos en Lancetilla solo hay una que es particularmente interesante, siendo la cabeza de un mono que originalmente debe haber formado la agarradera en forma de efigíe de algún polícromo vaso cilíndrico. De acuerdo con S.K. Lothrop pertenece al período de Copán y Quiriguá, y no a la última era. Ejemplares muy parecidos han sido encontrados con frecuencia en el Valle de Ulúa y en El Salvador. Formas un poco diferentes basadas en la misma concepción Maya se encuentran en los artefactos Chorotecanos de Nicaragua y Costa Rica.

Tal es lo que la arqueología nos ha enseñado respecto al valle de Lancetilla. Será posible que con tan escasa colección de material se pueda reconstruir una visión de la existencia de aquellos que hicieron y usaron los artefactos que hemos descrito? Talvez podemos aventurar un bosquejo, permitiendo que nuestra imaginación le pinte los colores.

LANCETILLA DE ANTAÑO

Incontables oleadas de tiempo deben haber pasado sobre el Valle de Lancetilla antes de que voz humana alguna llamase a su pareja entre la húmeda espesura, en tanto que fuera de este santuario de vida salvaje, más allá de la sombra protectora de sus colinas, razas de hombres en todas las etapas de cultura primitiva se ocupan de extender sus territorios o encontrándolos inapropiados, iban en busca de nuevas tierras. Algunas de estas razas emigraban de los ggrandes centros civilizados del Norte; otras abríanse paso hacia arriba; venían del Sur.

Aequeológicamente hablando, en tiempos relativamente recientes

talvez alguna tribu buscaba la tierra prometida de su mitología o trataba de escapar de la presión de gente más poderosa entrando asi en ésta región. La proximidad del mar no les arredraba. Ellos procedían de la tierra como sus antecesores de quienes habian aprendido a domar las piedras para usarlas y encontrar su comida en las selvas. Entre sus reliquias nunca se han encontrado conchas de mar al natural, ni trabajos de éstas en manera alguna.

Su vivir errabundo pudo haberlos traído por el Valle del Ulúa en donde vieron otras tribus y otras cuáturas. Quizá platicando con los fabricantes de utensilios de barro que eran mucho más diestros que ellos para modelarlos. Puede ser que cambiaran alguna de sus bien forjadas piedras por souvenirs de barro pintado. Un jarro tallado con cabezas de mono pudo haber sido usado en las ceremonias para inducir a los dioses a mirarlos favorablemente en sus emigraciones. Un amuleto de jadeita grabada de otro diseño, pudo haberles traído la fortuna y ayudado a rechazar los espíritus malignos.

Encontraron la tierra de sus sueños. Se establecieron y construyeron casas para ellos y templos para sus dioses. Sembraron maiz y otros comestibles en el valle y cazaron en las colinas. Vivieron, tuvieron hijos y murieron.

Cuántos años transcurrieron asi? Lo ignoramos. Siglos quizá... I entonces, súbitamente, sin aviso alguno, aparecieron grandes casas flotantes en la bahía. Hombres barbudos, extraños; hombres de caras blancas salieron de ellos hablando un lenguaje extrangero. La gente de Lancetilla se apresuró a consultar a sus ídolos. Que significaria todo esto?

Los verdes dioses de piedra guardaron silencio. El incienso ofrecido en los templos no quiso ascender. Al contrario, un viento desconocido lo arrolló hacia el mar donde lo aspiraron los recién llegados contestando con estruendosos cañonazos...

Veinte y cuatro años mas tarde, el Rey de España comisionó cuatro hombres para hacer un viaje a Honduras y avisarle en que condiciones se encontraba el país. Estos le informaron asi:

"La tierra está tan terriblemtne desvastada y desolada por la gran destrucción que los pasados Gobernadores hicieron alli, que hemos viajado hasta treinta leguas de distancia sin encontrar un alma y nos hemos visto obligados a dormir a la intemperie. Los indios dicen que recuerdan bien cuando los cristianos llegaron, robaron, saquearon y quemaron las aldeas llevándose las hombres y mujeres como esclavos."

(Traducción de Mercedes
L. de Blanco, Tela 1931)

The Mango

Among the delicious fruits of the tropics, the potentialities of which have not yet been fully realized in the New World, the mango is certainly the best example. Mangos we have in abundance, wherever that climate and soil are suitable, but mangos of superior quality are scarce, even non-existent in many regions. Here is where tropical horticulturists have an opportunity, which up to now has not received much attention, with the exception of a few regions such as Southern Florida and the West Indies, where developments of the past century or less have shown what can be expected.

Origin of the Mango, and a bit of History

Botanists working in the Asiatic tropics have described some 40

species of the genus Mangifera to which the Mango belongs. The cultivated forms of this fruit are generally considered to have been derived from one species, M. indica. Alphonse de Candolle, whose studies regarding the origin of cultivated plants are accepted as authoritative, believed that mangos have been grown in southeastern Asia not less than 4000 years. The natural home of Mangifera indica has been considered by most botanists to be the lower slopes of the Himalayas, whence it was carried by man to all parts of the great Indian peninsula and eastward to Indochina, Malaya and adjacent regions, including the southern Philippine Islands, where it was not known until about 1400 A.D.

Differences in bearing habit & fruit characteristics between the mangos of India and those of Indochina, Moreover, the considerable number of species

Coming from Asia across the Pacific

3

if not probability (as I personally believe)

of Mangifera which produce edible fruits, suggests the possibility that more than one species of Mangifera has entered into the development of the mangos in cultivation today.

Turning now to the history of the mango in the New World. There is a record to the effect that the Portuguese brought it to Brazil from their Indian settlement at Goa about 1640. From Brazil it is said to have reached Barbados in 1742 (the first known introduction to the West Indies). It reached Mexico from the Philippines during the same century. It is worthy of note that this introduction brought to the New World the Indochinese mangos (known in Mexico as mangos de Manila) as opposed to the Indian mangos which the Portuguese brought to Brazil.

One of the first dramatic incidents in connection with mango introduction in the Americas,

which, at the same time, appears to have been somewhat effective in increasing the number of kinds or types of mangos in Tropical America, was the capture by Lord Rodney's squadron of a ship which was carrying mangos, among other things, to the French islands in the West Indies. This was in 1782. The mangos and other plants were turned over to Hinton East, owner of an important garden near Kingston Jamaica. One of the mangos bore the label "No. 11" which name persists to the present day.

During the 19th century the British brought to their West Indian colonies some of the finest mangos from India including Pairi (known also by several other names, apparently), and the French were responsible for introducing into their colonies from ~~Reunion~~ the South Pacific a group of varieties, one of which, Julie, became very popular and

has remained so to this day. In 1889 G. Marshall Woodrow sent to the United States from Poona, near Bombay, India, grafted trees of several fine mangos of that region. One of these, Mulgoba, survived only to provide the necessary stimulus To the development of commercial mango growing in southern Florida.

Since this chapter is concerned with mango growing in tropical America it is appropriate to mention that During the early 1900s David Fairchild of the United States Department of Agriculture was instrumental in obtaining more than 80 varieties of mangos from all parts of the tropical World. These were sent to the U.S Plant Introduction Garden in Miami, Florida. While none of these imported varieties has proved satisfactory commercially, although from this collection, plus the famous Mulgoba, have come many of the fine mangos which from the famous Mulgoba and some of these introductions have come most

are being planted in Tropical America today.

C. Classification

Based upon geographical origin and natural characteristics of the tree and fruit, horticulturists today divide cultivated mangos into two great groups, ~~which may perhaps be called Divisions~~. These are:

Indian mangos. Most of the varieties cultivated in the Indian peninsula, in Tropical America, and several other parts of the world belong in this group. The fruits of primitive forms often have a resinous taste ("turpentine" it is sometimes called) which in the finer varieties is toned down to impart a delicious, aromatic flavor. The bearing habit of the tree ~~tends to be~~ is somewhat different from that of the second group. The fruits, extremely variable in size, are commonly plump, rounded at the apex, dark green to yellow to deep crimson, often a combination of yellow and red. The flesh is full of fiber

except in the finer cultivated varieties. The seeds are usually monoembryonic in these, ~~latter~~, polyembryonic in the more primitive forms.

Indochinese mangos. These are grown throughout Indochina, and in adjacent regions. ~~In the bearing habit of the trees and the character of the fruits~~ They are so different from the Indian mangos as to suggest a separate genetic origin - ~~perhaps~~ as has been mentioned ~~a mixture of two species of Mangifera~~. The fruits are typically borne in long clusters, they are long and pointed, flattened ~~laterally~~, under any color but yellow, free from any of the "turpentine" taste. There is very little fibre and this is close to the seed. In this group belong the Manila mangos of Mexico and the Filipinos of Cuba, as well as the Cambodiana and Saigon mangos grown in Florida, where they ~~Indochinese mangos~~ are not popular commercially due mainly to lack of attractive

color and what has been termed a "bland subacid" taste. On the other hand, they have long been favorites in the markets of Mexico and Cuba.

The basic division of most cultivated mangos in two groups is the first step toward a natural classification ~~of mangos~~ in races and groups of varieties, ~~which is made very difficult by cause of the great variation which has taken place among millions of seedling trees down through only the centuries, but millennia.~~ But the work which has been done in the greatest of all mango countries, India, as well as in Florida, the West Indies, Hawaii and a few other regions has shown that a classification based on natural characteristics may have great practical value when compared with the artificial classifications which have been based on some such character as form of fruit only.

There are seedling races, — groups in which the members have

several important characteristics in common which are inherited when trees are grown from seed - for example the mango and manga races of Cuba. In the first named the trees are tall, the fruits uniform, kidney shaped, yellow with some red color. In the second, the tree is lower-growing with a broad crown, the fruits round or somewhat oblate in form, with mixed color.

Within the race there may be groups of varieties propagated by grafting or budding. The members of these may have several characteristics in common, such as productiveness, size, form and color of fruit, flavor, and season of ripening.

Varieties

Reviewing the pomological literature of a century ago, one finds plenty of apple and fruit varieties which are still cultivated in Europe and the United States. Reviewing the mango literature of a century ago (there

is not much to review) we find Indian mango varieties which still seem to be known. Some of these varieties were brought to America but not one of them is commercially important today. Mulgoba was for a short time, in Florida. Pairi or something very similar, on an extremely limited scale, in the West Indies.

The point is that Mango varieties (cultivars) which are being propagated and planted commercially in tropical America today have originated within the past 50 years, most of them still more recently. It is not possible here in a book of this nature to describe, even briefly, more than a few varieties. The following list includes some of the best which have been planted in Tropical America, though by no means all. And when we say "the best" we are relying on the opinions of mango growers in southern Florida more than our own, for they have had more experience.

Old vars are superseded by better ones

~~And~~ The prospective mango grower who reads these pages, ~~20~~ or even 10 years from now (1977) ~~after this~~ ~~is published~~ will do well to ask somebody who knows if the varieties ~~herein~~ described are still considered among the best. ~~The Valencia and Washington Navel oranges have been commercially important for a long time, but citrus culture has been stabilized, when compared to mango culture which is a very young industry.~~

Haden. For some years the commercial mango industry of Florida was based upon this variety which originated as a seedling of Mulgoba. As a commercial mango it leaves ~~nothing~~ little to be desired except productiveness. It is no longer being planted extensively in Florida, ~~but There are probably more Haden mango trees in tropical America than there are of any other grafted mango. In Florida,~~ its ~~sale~~ production (because of its tendency to de-)clined ~~seriously~~ after the trees reached (in commercial orchards has

12 to 15 years of age. We can not say that this has been true in tropical America. We know of numerous trees 30 to 35 years old which still bear good crops, though with the same erratic alternation shown by most many other fine mangos. To get away from this important characteristic in Florida, everyone has been trying to find or develop a mango as good as Haden but more productive.

Haden is a large fruit, commonly 15 to 20 ozs in weight. It is unusually handsome fruit, a beautiful combination of deep yellow and bright red. The flesh is free from fiber except very close to the seed. The two sides of the fruit can be cut off and the firm juicy flesh eaten with a spoon. The flavor is fairly rich, subacid, the quality rated good by most authorities. Haden is one of the first commercial mangos to ripen. The tree is a strong grower, large and shapely.

Cambodiana. This is not considered a commercial variety in Florida but is included in this list because it is one of the Indochinese mangos which has been propagated by grafting and because it is so productive of medium sized (10 oz) fruits, oblong-ovate in form, yellow-green in color, practically fiberless, subacid in flavor. A good home garden variety for those who like the Indochinese mangos. It ripens early in the season.

IRWIN. ~~Perhaps~~ One of the best of the newer Florida varieties ~~mangos~~ from the standpoint of productiveness and quality. Form ovate, weight about 12 ozs, orange yellow with plenty of red over most of the surface, flesh fiberless, quality rated good to very good. This variety has shown great promise in Central America.

Carrie. One of the Florida favorites as a home garden fruit, because ~~the fruit~~ it is "juicy very rich aromatic and fiberless" (~~See Ruehle~~)
(Ruehle and Lebin)

This variety has Julie in its ancestry and therefore does not grow as large as many others. It ripens about mid season.

Julie. Included in this list because it is ~~just about~~ the most popular home garden variety in the French West Indies and Jamaica. The tree is a dwarf - quite an advantage where space is limited. The fruits are flattened on both sides, 6 to 10 ozs in weight, not very attractive in appearance, but of a sweet rich flavor liked by everyone. Besides its dwarfness the tree has another unique character. It blossoms just whenever it feels like it and produces a few fruits every once in a while - never a big crop. It is one of the curiosities of the mango world. Not easy to classify.

Amini. Here we have to be careful, for two reasons: The literature from India suggests that more than one mango may be known

by the name Amini in that country (where nurserymen have succeeded in confusing mango nomenclature almost to the point of no return) and secondly, because commercial growers in Central America do not think much of this particular Amini which was intro. by the U. S. Dept of Agriculture some 60 or 70 years ago. The trouble is that Amini is a small mango and that it is considered slightly acid by many people. But it has borne good crops more regularly than most Indian mangoes, and nothing could be more attractive than a basket of these highly colored, delightfully aromatic and fiberless little fruits.

Kent. Another of the newer Florida mangos which has shown great promise in tropical America where large mangos are popular. An ovate, plump fruit up to 24 ozs in weight. Yellow overspread with red. The flesh is juicy and fiberless, rich and sweet, the quality ~~not~~ very good to excellent. It

ripens later than Haden, in fact is considered "one of the better late mangos." (Ruehle and Leon)

Keitt. The matter of ripening season has not yet been given much attention in Tropical America. The same has been true of avocado but with that fruit we get prediction all the years round by having the different races and a taking advantage of the great range in elevation. Keitt should be given attention in Tropical America because in Florida it is considered the "best of the very late mangos." It is oval in shape, up to 24 ounces in weight, yellow with a reddish blush, juicy, rich and sweet, almost fibreless. The quality is ~~not as~~ very good and the fruit ships well. The tree has long arching branches and is rather scraggly in appearance.

Tommy Atkins. A commercial variety which at the present time is being ~~is~~ planted more extensively than any other in Florida.

The reasons are two: it bears good crops and is popular on the market. It is medium sized, brightly colored, not considered by most horticulturists to be of the best quality, but it keeps and ships well.

Manila. This name has been mentioned in connection with the Indochinese ~~group~~ mangos. It is not a horticultural variety, it is the name given in Mexico to the mangos, mainly from Veracruz state, which come on to the markets of Mexico in great quantities every year. Because the Indochinese mangos are polyembryonic there is very little variation among the fruits of the thousands of seedling trees seen in Mexico. Looking at these mangos on sale in Mexico City one would think they came from grafted trees of a single variety. The long pointed lemon-yellow fruits are juicy, almost fiberless, ~~tremendously popular~~. - subacid in flavor.

The Carabao mango of the Philippine Islands, which is seen occasionally in tropical America, is very much like the Manila of Mexico. It represents another seedling race of the Indochinese mangos.

New varieties of tropical American mangos origin began to appear some years ago, mostly as seedlings of Indian varieties or those with Indian "blood", such as Haden. It is necessary to mention also the vast number of seedling races which are given local names, a circumstance which tends to confuse inexperienced growers who fail to understand the difference between a seedling race and a grafted variety or clone, as it is termed by professional horticulturists. Sometimes selected individuals of these seedlings are good enough to merit vegetative propagation. Often the trees bear good crops with greater regularity than the finer grafted sorts, and the flavor may be sweet and rich, but usually there is too much fiber present, except in the case of Indochinese seedlings.

Climate and Soil.

For good results in mango culture much attention must be paid to ~~the matter of~~ climate, not so much to soils, for the mango is not at all exacting in this respect. It will grow and bear fruit on poor soils - thousands of "wild" trees on stony mountainsides in the West Indies and elsewhere prove this conclusively. But the trees will not attain the large size of those on rich lowland alluvial loams. They are likely to produce more fruit, however, if on soils which discourage luxuriant vegetative development. If on rich lowland soils in a region of all-the-year-round heavy rainfall very little fruit may be produced.

A warm climate is preferable, though cool weather during several months of the year does no great harm - Southern Florida does not have a truly tropical climate but is good mango country as long as

no temperatures much below the freezing point are experienced. ~~During the winter months.~~ In Central America mangos are rarely planted above elevations of 3000 or 3500 feet, ~~if good results are desired.~~ Occasionally they are seen at 4500 or even 5000 ~~feet~~, but growth is retarded and there is insufficient heat to ripen the fruit properly.

The ideal climate ~~is one characterized~~ is one characterized by a ~~two to~~ a long and severe dry season, which begins ~~two or three months~~ before flowers appear and continues well into the fruiting season. Abundant rains during the period of flowering may interfere with pollination (though not too much information is available on this point) but they certainly make difficult the control of the universally troublesome disease known as anthracnose. ~~(see the discussion of this matter at the end of the chapter).~~

Propagation

The time has passed when tropical American horticulturists who propose to develop commercial mango orchards will plant seedling trees. They show too much variation in productiveness, size and quality of fruit, unless they are polyembryonic seedlings and even these are much slower to come into bearing than grafted trees.

Presumably because of the variation which characterizes the monoembryonic mangos when grown from seed, Indian horticulturists have for centuries resorted to vegetative propagation in order to perpetuate superior trees which originate as chance seedlings. Just when the art of grafting was developed in tropical Asia is not known. It is generally believed that the Portuguese, who in 1510 established a colony at Goa on the west coast of India, were the first to graft mangos, but the sacred books of the Hindus written in the 7th and 8th centuries of our era, speak of grafting as one of the essential

in Sanskrit in the

qualifications of a gardener.)

Inarching or grafting by approach, ~~still used more than any other method~~, was unquestionably the method employed from the earliest times. This consists of placing potted seedlings (rootstocks) on platforms around a tree it is desired to propagate; cutting a strip of bark of one one side of its stem, followed by a similar cut made on a small branch of the parent tree, then binding together the two cut surfaces. When a union has been formed, the scion-branch is cut from the parent tree below the graft union, and the top of the rootstock cut off above it. This ~~is~~ a simple but laborious process, ~~but~~ involves few failures.

In the New World, commercial mango culture really got its start in Florida about the year 1900, when George B. Cellon produced nursery stock of the Mulgoba mango by using the patch bud. Shield budding then came into use, followed in Florida and the West Indies by two or three kinds

of grafting. Chip budding, which amounts to veneer grafting with a shield bud on very young rootstocks, was considered promising at one time.

Other techniques have been developed in Florida, the West Indies and elsewhere. But the veneer graft has largely superseded all these because it has given excellent results everywhere in tropical America that it is the only one which will be recommended here.

Its advantages are: (1) It has been more uniformly successful than other grafts, and (2) In case of a failure, the rootstock can be re-grafted, which is not the case when the crown-graft or certain others are employed.

The production of grafted mango nursery stock is not as easy as the production of Citrus or avocados. That is to say; much more attention must be given to certain details. In the first place, rootstocks must be in just the right condition - full of sap, preferably showing a new flush of

growth. In the second place, scions should be mature tips of branchlets, swollen and about ready to burst into growth. ~~To make assurance doubly sure,~~ It is well to prepare them two weeks in advance by trimming off the leaves from the branchlet tips it is proposed to use, down to a point 6 or 8 inches below the tip. The petiole stubs 1/4 inch long, will dry and fall off.

Thirdly, after the rootstocks have been grafted, the soil in which they are growing—whether in containers or in nursery rows, must be kept moist all the time. Failure to supply water regularly has been the cause of many failures in tropical American nurseries.

Methods of grafting are better learned from illustrations than from descriptions, hence Fig. — should be studied carefully. Details of special importance are these: The scion and the seedling rootstock should be of nearly the same diameter—about 1/2 inch. The longitudinal cut on the rootstock should not extend into the wood to any great depth.

which should 6 or 8 inches above the ground,

The "step", a short flap of bark left at the lower end of the cut should be used as a rest for the end of the scion which should be trimmed to form a short wedge. And most important of all, the top of the scion should barely extend above the graft. One of the commonest and most serious mistakes of Tropical nurserymen has consisted in leaving 2 to 4 inches of scion exposed above the graft. This is often fatal, due to drying out. Vinyl film or a similar polyester plastic should be used for wrapping the graft. The union of stock and scion takes place in three or four weeks and the scion breaks into growth. ~~If it fails to do so, the probability is~~ that the soil has been allowed to become too dry. When the scion has attained a height of 5 or 6 inches, the stock may be cut back, but not too hard, - six or eight inches with the leaves on, should be left above the graft union. After the scion has made its second flush of growth, the top of the stock may be removed completely by a smooth diagonal cut immediately above the union.

Grafting may be done at any time of the year, provided the rootstocks are in active growth. And of course grafted plants can be moved at any time but it is best to take advantage of the rainy season in regions where there is one. ~~In tropical America~~, Field grown grafted trees are likely to be more sturdy than those grown in ~~plastic~~ containers, but they should never be moved with bare roots. They must be dug with a good ball of soil, wrapped and tied firmly. (In the United States nursery stock handled in this fashion is termed "B an B" - balled and burlapped). In regions where the soil is so light that it will not hold together when the tree is dug in the nursery, grafted plants must be grown in ~~pots~~ plastic or other containers, ~~must be used~~. Light wooden boxes 8 x 8 x 15 inches are satisfactory but expensive; tin cans ~~which~~ such as in which lubricating oils are used, ~~have been used for lubricating oils~~ are sometimes available. Plastic containers are by far the most popular today; they can be had in quantity are ~~are~~ cheap.

It is not necessary to describe

the production of seedlings to be used as rootstocks, except to mention that it is always preferable to remove the husks from the seeds before germinating them in moist sand or other well-drained and aerated material.

Regarding the merits of different rootstocks, little is known. In the tropics generally the nurseryman uses what he can obtain most conveniently. This is pretty nearly the situation in other parts of the world. Dutch horticulturists in Java have recommended the variety Madoe, because of its vigorous growth. This variety was brought to Central America in 1927, but no comparative trials of races or varieties, with a view to determining which make the best rootstocks, have yet been made up to now. ~~In Israel, where much research and successful work on tropical fruits has been carried out, Dr Oppenheimer has been conducting mango root-stock trials for ten years or more.~~ In Florida, where much research on mango culture

has been conducted, "there has been very little study of the best rootstock to use for propagation" (Ruehle and Reding). It has been reported, however, that the Indochinese mangos, such as Saigon and the Philippine, have weak root systems and are not very drought tolerant. The monoembryonic mangos are preferred by some nurserymen, since the seedlings are vigorous when young, but they show considerable variation. Weak plants should be discarded.

Top-Working Old Trees

On several occasions there have been programs in tropical America which envisioned the conversion of thousands of sturdy (but not too old) seedling mango trees in tropical America, which now produced fruit of limited commercial value, into top-worked trees of fine, fiberless varieties. Various methods of top-working have been suggested. Perhaps the most successful consists in cutting back the main branches of a tree leaving stubs 3 to 5 inches in diameter; waiting

for these to send out strong sprouts; removing all but three or four of these on each stub, and when these selected sprouts have attained a diameter of an inch or so, veneer grafting them with scions of the desired variety. When the grafts have attained a length of 8 to 12 inches the tips should be cut off the top to encourage branching. It has been recommended that not all of the sprouts from the stubs be cut away; several should be left for a while To furnish shade for the grafts. Top-working should be done early in the rainy season. On very dry climates irrigation is necessary until the top-worked tree has made good growth.

The Major Problem

The erratic behavior of grafted mango trees ~~of the first varieties~~ is notorious. Lack of regularity in ~~crop production~~ bearing has greatly retarded the development of the mango industry in tropical and subtropical regions everywhere.

But regardless of the weather, some varieties show a strong tendency

Weather, of course, is a major ~~cause~~ factor, ~~about everywhere. Mangos seem very sensitive to annual variation.~~ To bear in alternate years. Some (not many) bear every year, ~~some~~ others are very erratic in this regard, ~~which may be due to the nature of the climate in which they are grown, or it may be due in part to other factors. And~~ To make the problem still more difficult, in an orchard of one hundred trees of a single variety, ~~some~~ will be seen which are carrying ~~good crops~~ good crops while others are not, and to add insult to injury, ~~some of~~ the terminals on several branches of a tree may be loaded with fruit, while terminals on other branches have nothing on them.

During the past half century this exasperating problem has been approached from many angles, both in the New World and in the old. It was thought at one time that the failure of the grafted Indian mangos to bear large crops ~~of fruit every year~~ might

be a matter of pollination. But the trees do not always produce flowers every year. It was observed that, when there were flowers fruits usually followed, unless the fungous disease known as anthracnose destroyed them. ~~this again is related to weather~~, [illegible] ~~just as it frequently effects pollination at times — perhaps especially in the case of those varieties which do not produce much pollen, or where there is a scarcity of pollinating insects.~~

All in all, the matter of pollination has not seemed, to most workers, of major importance. Not so the nutrition factor. Girdling the limbs to keep nutrients elaborated in the leaves from passing down into the roots, has usually been effectual. ~~effect~~. This treatment has an empirical base. In numerous tropical countries the peasants hack the trunks of mango trees, with machetes or axes. This is done ~~and it is done then~~ on a certain Saint's day each year. While the peasant does not know why it

must be that particular Saint's Day, it happens that he has learned some way of the year for this treatment to be most effective in encouraging flower-bud initiation.

Girdling or ringing large limbs has not supplied the answer, in a commercial sense. Neither have fertilizer experiments, or the application of common salt to the soil in which the tree is growing (this has been recommended by certain Indian growers) nor has root pruning.

Thus, the greatest problem in mango culture, continues to be investigated. Much may yet be learned. But the present trend is to develop more satisfactory varieties through the selection of chance seedlings. Little has been accomplished up to now through the production of hybrids developed by standard methods of plant breeding, though thousands of controlled hand pollinations have been made.

or other, that it is the right time

a more extreme treatment of the same sort

Planning the Orchard

Before investing money in a commercial mango orchard, there are several matters which should receive serious considerations. First of all, what varieties should be planted? If the fruit is to be marketed locally, do consumers have any long-established preferences with regard to size, or color, or other important characteristics? Prejudices exist with regard to other fruits: it is hard to sell yellow apples in some countries; red ones are wanted. And Florida wants mangos with plenty of color, though Cuba and Mexico buy yellow mangos (~~not necessarily, perhaps, by preference~~) because they have ~~long~~ been accustomed to the Manila and Filipino seedling mangos, which have no color but yellow. Flavor also enters into the picture; the Indochinese mangos lack the aromatic, spicy character of the Indian varieties, but there are many people who like them.

Large mangos are popular in the tropics. Large avocados used to be popular in California, but the North American housewife now prefers those that weigh less than a pound; they are not so expensive. There are delicious mangos that do not weigh more than half a pound; there are others - rarely so delicious - which weigh 3 or 4 pounds. Haden, which weighs a pound to a pound and a half, has been well received in tropical American markets.

Markets, of course can be educated. This is not going to be difficult in the case of fiberless mangos. When avocados from Florida were just placed on the North American market there were only two grafted varieties - Trapp and Pollock, both green in color. Many people had to be convinced that purple avocados can be just as good.

The Tropical American horticulturist who plans to grow mangos on an extensive scale should by all means include varieties which will enable

~~possible for~~ him to put fruit on the market during as many months as possible. ~~This point has been~~ ~~emphasized~~ in the notes regarding varieties. Because commercial cultivation of grafted mangos is such a new industry in tropical America scarcely a thought has been given to this feature. ~~Eventually growers are going~~ ~~to make some money by planting~~ ~~varieties which will come onto the~~ ~~market after other mangos have gone~~ ~~out of season.~~

The location of the orchard should receive more attention than has been given it in numerous instances. ~~It is~~ assumed, of course, that the prospective grower knows that his land is in a good region for ~~the~~ mangos, ~~he is going to plant.~~ The fact that there are many seedling trees in his neighborhood, trees which bear tremendous crops of fruits which are satisfactory in flavor but full of fiber, appreciated in the local market but worth only one cent each, may not mean

that the climate is ideal for fancy grafted mangos. He must be sure that climatic conditions are right; enough dry weather at the right time and enough rain at the right time, unless he is prepared to irrigate. The warm seasons should be warm enough; in tropical America this is largely a matter of altitude, as has been mentioned earlier in this chapter. There is no danger of the climate being too hot.

The land must not have a permanent water table close to the surface. Mango trees do not bear much if any fruit if the soil is not relatively dry during part of each year. As for the soil, it has been pointed out earlier in this paper, that rich soils may mean (and usually do) rank vegetative growth at the expense of fruit. The danger is less if the climate is a dry one and little water is applied through irrigation.

It is impossible to over-emphasize the importance of giving mango trees sufficient room. This point has not been appreciated in Tropical America

until recent years, when some of the first orchards of grafted trees commenced to attain mature size. No one seemed to realize that the tips of the branches, where fruit is borne, will not produce flower clusters if they are shaded. All sides of the tree must receive all the sunshine available. An orchard of Hadens in Honduras, spaced 24 x 24 feet is a prime example of the effect of close spacing. The trees are 30 years old; their branches have interlocked for more than 10 years. Only on the exposed side of the outside rows is much fruit produced, while a Haden tree of similar age standing alone in a garden yard a few hundred yards away, carries good crops over its whole surface. It was recognized 15 years ago that 24 x 24 is too close; 35 feet was thought satisfactory. The feeling now is that 45 feet is better, except perhaps on very poor soils. Close planting with the idea that alternate trees will be removed when

they begin to crowd never seems to work. Either the alternate trees are not cut out, or if they are, those that are left have been so affected by crowding that they never recover.

Mango trees are not like peaches, which only have a profitable life of 15 or 20 years. Grafted trees 60 years old are still in fine condition and productive.

There are a few dwarf varieties, of which Julie is the only one of any importance, which do not need more than 25 feet, perhaps. But it should never be forgotten that mango trees can not be trimmed as are some fruit trees. And they must never be deprived of sunlight. Nor is anything gained by pruning to "open up" the tree; fruit is borne only on the ends of the branchlets and these are on the outside of the tree.

Planting and Care

Horticulturists in southern Florida have devoted more attention to commercial production of fine mangos, and over a longer period of time, than those of any tropical American region. Small orchards were established in Cuba and in Puerto Rico however, in the early 1900s; more recently number ones ~~a dozen~~ have been planted in Mexico, in Central America, in northwestern South America and elsewhere. The experience gained in these regions has been made available to mango growers everywhere, but in general our most important source of information has been, and still is, Florida. Bulletins of the Subtropical Experiment Station at Homestead, the Proceedings of the Florida Mango Forum and publications in the horticultural press have been invaluable to those working in the tropics.

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At the same time, conditions ~~are~~ in southern Florida have

given mango culture a somewhat specialized character - for example the frost hazard, fertilizer requirements, marketing problems.

Not much needs to be said about planting the orchard, except to warn the prospective grower that he should make sure he obtains well-grown nursery stock, trees that are not too young and "soft", and above all, trees to name. In regions where there is a well-defined rainy season - and this means nearly all good mango regions, it is well to plant during the first rainy months. In any case the grower must be prepared to bucket-water recently-planted trees if rainfall is not adequate.

This brings up the matter of irrigation. The feeling has become general, in Tropical America that mangos should have plenty of water, and perhaps a little fertilizer, during the first two or three years. Once the trees are in production, the necessity of discouraging vegetative growth for

several months in advance of the flowering season must not be forgotten. In the best mango-growing regions of Central America the rains commence in May and end in November. In such areas no irrigation at all is given the trees after they have reached bearing age. While this does not eliminate the natural tendency to alternate bearing, it prevents the tree from continuing vegetative growth throughout the year and almost certainly results in more fruit.

In this connection, the following paragraph from Bulletin 574 of the University of Florida, "Mango growing in Florida" by Ruehle and Ledin, is considered highly significant:

"There is agreement among writers on mango culture that a check in growth after summer shoot development favors flowering, presumably by promoting flower bud differentiation. Withholding nitrogen fertilizers in the fall will tend to supply such a check to vegetative growth. A frost or severe

drought in late fall or early winter will do the same."

One of the major differences between mango growing in Florida and in Tropical America is that Florida soils are extremely low in nutrients and fertilization is essential, whereas in Tropical America this is not the case. In fact, for Trees in bearing nitrogenic may do more harm than good, unless applied at just the right time. Information on this point is scanty, even in Florida where it has been necessary To devote much attention to the subject. It would seem reasonable To believe that one or two applications of a complete fertilizer such as is used for citrus, might be useful in stimulating new shoot growth if applied at the commencement of the rainy season, which corresponds in a general way with the fruiting season; but that no fertilizer should be used toward the end of the rainy season or later. ~~It appears that~~ Orchardists in Tropical America have, up to now, given very little attention to the subject of

fertilization, and we could be induced to say this is just as well!

Mango orchards in tropical America are usually maintained in about the same manner as citrus, that is, the trees are "circled" - the land is cleared of grass and weeds over an area somewhat greater in young groves, than that covered by the branches. This work is usually done with a hoe, and has to be repeated several times a year. There is not much experience on which to base other practices, such as the use of leguminous cover-crops. It is customary, to use the land between the rows of trees for annual crops, though this is not always done, and of course must eventually be discontinued, though at a spacing of 45 x 45 feet at least 8 or 10 years will pass before the land must be devoted entirely to the mangos. If the "middles" are not used for annual crops or low-growing perennials - such as pine-apples, weeds must be held down by an occasional mowing.

Now about pruning. ~~This is a major~~

Many tropical horticulturists, ~~many of whom~~ insist that no fruit tree should be permitted to form a low crown close to the ground. Citrus trees are commonly pruned so that there are no branches within 5 or 6 feet from the ground. In this manner a large percentage of the potential fruit-producing surface is lost. (Pruning in Florida)

Mangos require no pruning, except to remove an occasional dead or broken branch. However, young trees of some varieties, for example Keitt, may need training at the start, in order to form shapely, well branched crowns.

Enemies of the Mango

~~In most parts of tropical America only are of importance - anthracnose disease and fruit flies. Even these are~~

There are only two pests of major importance in tropical America. Fruit flies are the worst; anthracnose disease may destroy flowers and young fruit, and seriously affect the appearance and keeping quality

of ripe fruit. While the fungus which causes this disease, Colletotrichum gloeosporioides, is present everywhere it does not attack all varieties of the mango with equal severity. ~~But~~ Much more important is this: "Incidence of the disease is closely dependent upon humidity. The prevalence of rains or heavy dews during the critical period for infection greatly increases its incidence." Most of the infection on bearing trees takes place from the beginning of the blossoming period on gradually decreasing severity until the fruit is about half grown". This quotation from Rucker and Ledin's bulletin 579, ~~and~~ is appropriate because much study has had to be given anthracnose and its control in Florida, hence more has been learned than in tropical America, where commercial mango growing has not yet attained sufficient importance to justify the expenditure of large sums in the

~~in the countless investigations of~~
~~of cultural problems~~ [illegible]
~~in Florida has made unnecessary, it~~
~~would seem, much further work~~
~~of this process. We too~~ [illegible]
~~[illegible] to take advantage of~~ for us
~~The information available in Florida.~~
~~This may be an expensive business~~
~~in some regions. On the other hand,~~
~~in some~~ others ~~of the best~~ mango ~~growing~~
~~regions of Central America, for~~
~~example~~, In some mango growing regions there is practically no rainfall, and humidity is very low, from the time mangos come into bloom and the period when early varieties are commencing to ripen. In Florida, again to quote Ruehle and Ledin, "In some seasons it may be necessary to apply only two in-the-bloom sprays, while in others four or more may be desirable." These sprayings must be followed by one or more as the fruit develops and approaches maturity. Bordeaux mixture 4-4-50 was recommended in the

Copper sprays are very effective in the control of this fungus and have a lasting effect, but they are slightly toxic to mango flowers. Fungicides such as Maneb, Zineb and Captan are also effective but the residual effect is short. They are superior to copper sprays for the bloom blight, but only copper sprays are satisfactory for applications on developing fruits - sometimes these must be made once a month.

Zineb and Maneb can be used with the proportions of 1½ lb. to 100 gallons of water, plus a liquid spreader. In place of Bordeaux mixture, a copper spray such as 4 lbs tribasic copper sulfate in 100 gallons of water, also with a spreader, to enable the spray properly to wet the waxy skin of the fruits.

Fruit flies of the genus Anastrepha are more troublesome in tropical America than any other insect pests. The females lay their eggs in the developing fruits; these

hatch and the fat white larvae which infest the fruit and render it so unattractive to the consumer eventually pupate in the soil beneath the tree, and after some days emerge as adult flies and repeat the cycle.

Commercial control has not yet been obtained. ~~but seems to be on sight, by means of chemical sprays.~~ For years it has been recommended that infested fruits before the larvae emerge and enter the ground, should be gathered and buried under 2½ feet of soil. This treatment does of course result in decreasing the population of fruit flies, but since these insects breed in a number of wild or semi-wild fruits likely to be present in the region - guavas + species of Spondias for example, it is very doubtful that effective control can be attained in this way.

There are two features which at times come to the growers aid. One, certain mangos, such as Julie, seem

to be resistant, and another, the flies of certain species do not seem to thrive in certain climates. Not much information is available on this point. It has also been suggested that infestation does not take place if the fruits are picked at an early stage of maturity. Here again, we do not have good information. Great hope lies in the perfection of chemical control by means of spraying.

Several of the common scale insects (Coccidae) occasionally infest mango trees, rarely to the extent which necessitates control measures. The standard control measures used for citrus are effective. It has been recommended that mangos should not be sprayed when they are carrying fruit.

Red mites are occasionally troublesome. They feed on the upper surface of the leaves, causing the entire leaf to turn brown if the infestation is heavy enough. This pest be-

comes serious only in the dry season. It can readily be controlled with lime-sulphur sprays or sulfur dust. ~~Malathion at 2½ lbs of 25% wettable powder in 25 gallons of water containing 0.7% of actual content of summer oil such as Volck forms a good general~~ ~~acaricide and miticide.~~

EARLY ACCOUNTS

The first Europeans set foot on the mainland of tropical America in 1499. They landed far to the east of the mouth of the Amazon, and in consequence probably did not meet with the avocado, whose distribution, so far as can be ascertained, did not at that time extend east of the Gulf of Maracaibo. Within a few years the northern coast of South America had been explored, and the first European settlements established. The early voyagers and colonists, casting about for foodstuffs to supplement the slender rations brought from Spain, soon made the acquaintance of numerous fruits and vegetables unknown to the Old World. Among these was the avocado.

Gonzalo Fernandez de Oviedo, a man of letters who had spent many years at the Spanish court, came to the New World with Pedrarias Davila in 1514. In the years immediately following, he obtained by travel and observation the materials which were later to form the basis of his "Historia General y Natural de las Indias," a work which entitled him to the honor of being considered the first chronicler of America. In 1523, he returned to Spain, and in 1526 published his "Sumario de la Natural Historia de las Indias," a brief account prepared at the request of the King,

who was desirous of knowing as much as possible concerning the New World. This work contains a description of the avocado, so far as known the first to appear in print. Translated into English, it reads as follows:

"On the mainland (Tierra-Firme) are certain trees called pear trees, but they are not pears like those of Spain, though held in no less estimation: rather is their fruit of such nature that they have many advantages over our pears. They are large trees, with broad leaves somewhat similar to those of the laurel, but larger and more green. They bear pears weighing a pound and even much more, though some weigh less, and the color and shape is that of true pears, and the rind somewhat thicker, but softer, and in the center of the fruit is a seed like a peeled chestnut, but it is very bitter, as was said farther back of the mamey, except that here it is of one piece while that of the mamey has three, but it is of the same bitterness and of the same form, and covering this seed is a delicate parchment, and between this and the rind is the part which is eaten, which is abundant, and a liquid or paste very similar to butter and very good eating and of good taste, and such that those who have these fruits guard them and esteem them highly: and the trees are wild as are the others which I have mentioned, for the chief gardener is God, and the Indians apply no work whatever to them. These pears are excellent when eaten with cheese, and they are gathered before

they are ripe, and stored, and when treated thus they ripen perfectly for eating; but after they have reached this stage, they spoil quickly if allowed to stand."

Oviedo did not see the avocado in the West Indies, apparently, for he says specifically that it grows "on the mainland;" neither does he give any vernacular name for it, but terms them "pear trees," because of the resemblance borne by the fruit to the pears of Spain in shape and color. In his later and more complete work, the "Historia General y Natural de las Indias," published in 1536, he goes one step farther, and calls them "wild pear trees," saying:

"As a matter of fact, while I took these trees to be wild and have seen them in the mountains, where neither the Indians nor Christians (Europeans) give them any care or attention, and the only gardener is God, and thus I have said in the report which I wrote in Toledo for His Majesty in 1526 (see translation above); afterwards, some years having passed, I saw many of these pear trees in the province of Nicaragua, placed by hand in the lands and dooryards of the Indians, and cultivated by them."

Twenty-four years after Oviedo published his Sumario, Pedro de Cieza de Leon completed the writing of his "Travels," which from several points of view form one of the most

valuable, as well as the most interesting, contemporaneous accounts of the Conquest. Cieza de Leon left Spain in 1532, when a lad of fourteen years, and spent the next seventeen years in South America as a common soldier, visiting many parts of the territory now occupied by Colombia, Ecuador, and Peru. He was unbiased, critical, and accurate in nearly all his observations. As a result, his notes on the regions visited, their inhabitants, and their natural history have been found of great value by modern students.

His story is told in strict geographical sequence, beginning at Panama and ending in Chile. He first mentions the avocado, under the name aguacate, as one of the fruits "belonging to the country" at Panama. Next he cites it as abundant in the northern part of Colombia, not far south of the Isthmus in a region little known at the present day; then in the vicinity of Arma, and then at the Spanish settlements of Cartago and Cali in the great Cauca valley of western Colombia. Along with guavas, pineapples, and several other fruits, he saw it in great abundance at Cali. Both here and at Arma he speaks of it as palta in place of aguacate: it should not be inferred, however, that the fruit was known by the Quichua name at either place in pre-Columbian days. Rather is it to be assumed that the Spaniards, some of whom had travelled in other parts of America and were familiar with the Aztec as well as the Quichua name, used them in preference

to local ones, just as an English-speaking traveller of today would describe an apple tree seen in Peru under the name with which he was familiar, rather than use the local one of manzana.

Again, on the road between Cali and Popayan, not far from the latter town, which lies in the mountains of southern Colombia, he says "There are many fruit trees, especially aguacates or pears, which are abundant and savory."

In the region of Puerto Viejo, on the Ecuadorian littoral, he found them abundantly, as in Colombia; and finally, in describing the numerous small valleys which open out onto the coast of Peru, he states that there are to be found in them, along with several other fruits, "great quantities" of paltas. He does not record having seen the tree anywhere in the highlands of Peru, though he spent much time in those regions and his notes are extensive.

In general, the impression given by Cieza de Leon's work is that the avocado was, at the time of the Conquest, one of several fruits commonly grown by the Indians of northern and western Colombia, the Ecuadorian littoral, and the small valleys of the Peruvian coast.

Though the Conquest of Mexico preceded that of Peru by ten years, the avocados of South America were mentioned in print before those of Mexico. The first work which contains a reference to the latter, so far as known, is "Mexico en 1554," by Francisco Cervantes Salazar. In this book the avocado is listed among the fruits sold in the market of

Mexico City, but it is not described. Fray Bernardino de Sahagun, in his Historia General de las Cosas de Nueva España, a work written some time previous to 1569, devotes considerable attention to the avocado, emphasizing, as did most of the early writers, its medicinal qualities. A translation of his account follows:

"There are other trees which are called aoacatl, they have dark green leaves, their fruit is called aoacatl, and is black on the outside, white and green within, shaped like a heart, and having a stone of the same shape; there are other aoacates which are called tlacoaataoaoatl, they are large; as with the first-mentioned kind, nursing mothers dare not eat them, for they cause diarrhea in their infants. There are other aoacates called quilaoacatl, the fruit of this variety is called by the same name, they are green on the outside, and also very good and highly esteemed."

Father Joseph de Acosta was the first to publish an account in which distinction is made between the small, thin-skinned Mexican avocados and the larger, thick-skinned ones of South America. In Book Four of the "Historia Natural y Moral de las Indias," published at Seville in 1590, he devotes a chapter to "Mameyes, Guayavos y Paltos." After describing the two first-named, he gives a succinct account of the avocado which may be translated as follows:

"The Paltas, on the other hand, are hot and delicate. The Palto is a large tree, well-formed, with a good head of foliage, and its fruit has the shape of large pears: within it has a rather large stone: the rest is soft flesh, and when fully ripe it is like butter, and of delicate and buttery taste. In Peru the paltas are large, and have a thick rind which can be removed entire. In Mexico they are small, as a rule, and have a thin skin which may be peeled like that of an apple. They consider it a wholesome food, and one that is inclined to be hot, as I have said."

The medical use of the terms hot and cold, by writers of the sixteenth and seventeenth centuries, deserves a word of explanation. When applied to foodstuffs and other substances, they were intended to indicate the supposed effect upon the human body. It will be noted that they appear in several of the accounts translated in connection with this study of the early history of the avocado.

The first reference to the avocado in works of the seventeenth century is in Clusius' Rariorum Plantarum Historia, published in 1601. The principal interest of this account, which is a fairly complete botanical description, lies in the fact that it was based on a tree grown in a garden at Valencia, in Spain. From this it is clear that the avocado was introduced into Europe before the end of the sixteenth century. The seed was probably of Mexican origin.

Garcilaso de la Vega, son of one of the Spanish

conquistadores and an Inca princess, writes in his "Royal Commentaries of the Incas," published in 1605 (without doubt the best history of pre-Columbian Peru) that the avocado was brought to the region of Cuzco shortly before the arrival of the Spaniards. He says, "Tupac Inca Yupanqui marched to the province of Cañari, and on the road he conquered another called Palta, whence they brought to the warm valley near Cuzco the wholesome and delicious fruit called Palta." On another page, in describing the plants of Peru, he says, "The fruit which the Spaniards call a pear, because it is like one in its green color and its shape, the Indians call palta, because it was brought from a province of that name, and introduced into the others. But it is three or four times as large as a Spanish pear. It has a soft and delicate rind, inside of which is the pulp, about a finger in thickness. In the center is the kernel or bone, as the very accurate will have it. This kernel is the same shape and thickness as a common pear, but it has not been ascertained whether it is useful for any purpose. The fruit is very good and very wholesome for sick people. Eaten with sugar, it makes a very agreeable conserve."

Francisco Hernandez, an eminent physician of the Spanish court, was sent to Mexico by the King for the purpose of

investigating the medicinal virtues of the plants found in that country. His mission was viewed as an important one; he was given the title of "Protomedico of the Indies," and five years were allotted in which to complete the task. He labored industriously from 1570 to 1575, traveling widely and bringing together many interesting data, which were compiled in sixteen manuscript volumes. Upon returning to Spain, copies were left in Mexico. It was the intention of Hernandez to publish the original in Europe, but misfortunes overtook him, and it was not until 1651, or seventy-five years after his work was finished, that it was finally printed.

In the meantime, a friar of the Dominican order, Francisco Jimenez, obtained access to the manuscript left in Mexico City, translated into Spanish certain portions of the work, added many items of his own, and published a book in the hope that it would be of use to those who lived in remote and isolated parts of Mexico, where there were no physicians or druggists' shops.

In translating Hernandez' account of the avocado, Jimenez added very little new material, -- nothing of importance, save that the name of the fruit was corrupted to aguacate by the Spaniards. His work appeared in 1615. Following is a translation of Hernandez' original Latin version, as published in 1651, with the omission of a few items of purely medical interest:

"Of the Ahuaca Quahitl, or the oak-like tree with buttery fruits. Chapter LVIII.

AHUACAQUAHUITL, or the tree like an oak, with pendulous fruits, is tall, with leaves like those of the orange, but deeper green

larger, and rougher. The flowers are small, white to cream colored, the fruits shaped like an egg but often larger, or perhaps better described as having the shape and size of the early fig, black on the outside, greenish within. They resemble butter in richness, and have the flavor of fresh walnuts, the leaves are fragrant, hot and dry in the second degree. For this reason they are used in lotions; the fruits also are heating, but pleasing to the taste and by no means bad food, but rich and moist..... They contain seeds varying in color from white to reddish, solid, hard, and smooth, divided in two parts like an almond, oblong, and larger than dove's eggs; they have the flavor of bitter almonds, and if pressed yield an oil not unlike that of the almond, not only in odor, but also in flavor and uses.....The tree is green throughout the year, and is found growing in many regions, sometimes cultivated, sometimes not; it is best suited and attains its largest size when in a warm climate and on level ground."

One of the most complete accounts written in early days is that of Father Bernabé Cobo, who published, in 1653, a work entitled "Historia del Nuevo Mundo." His chapter on the avocado, with the omission of a few medical items, may be translated as follows:

"Concerning the Paltas.

The Palta is a tree of very attractive appearance,

shapely, the size of a large fig tree, symmetrically branched and moderately spreading; its leaf is similar to that of the mulberry, a trifle larger, and its fruit is one of the finest in the Indies; in fact, many give it the palm, placing it ahead of all others. It is spindle-shaped and commonly the size of an average quince; in some regions it becomes as big as a small squash or large citron, the varieties of the province of Yucatan in New Spain (Mexico) being of this class. The Palta has a thin skin, more tender and flexible than that of a Ceuta lemon, green externally, and when the fruit is quite ripe, peeling readily. It has the largest seed that I have ever seen in any fruit, either in the Indies or Europe; it is as big as a hen's egg, and spindle-shaped; it is of a white substance varying to red, tender like the meat of a chestnut, and covered with a grayish parchment. It has the flavor of bitter almonds, and when pressed it yields an oil like that of the almond. Between the seed and the rind is the meat, slightly thicker than one's finger except at the neck, where it is very thick. It is of whitish green color, tender, buttery, and very soft. Some people eat it with sugar and salt, others just as it comes from the tree, it being of such good flavor that it requires no seasoning. But, in spite of its pleasing taste, it should be eaten in moderation, for it is considered, like nearly all the fruits of these Indies, to be heavy and indigestible. The best Paltas come from hot, dry regions; the finest of this

kingdom of Peru are those of the valley of Ica and those of the province of San Garo (Asangaro), in the diocese of Guamanga.

There are three different kinds of Paltas. The second kind is a large, round one which is produced in the province of Guatemala, and which does not have as smooth skin as the first. The third is a small Palta found in Mexico, which in size, color and form resembles a Breva fig; some are round and others elongated, and the skin is as thin and smooth as that of a plum. In some regions they cut the immature palta in small bits and put it in brine, to take the place of olives.....The wood is useful in construction, and for fuel. The name Palta is current in the language of Peru: in the major portion of the Indies the fruit is called aguacate, which is the name given it by the Indians of Hispaniola.

It is scarcely necessary to mention that Father Cobo was mistaken in the origin of the name aguacate, which is Mexican and not West Indian. Other and later authors have fallen into the same error. With this exception, the account is accurate, and particularly valuable as showing that the existence of three horticultural groups of avocados (now termed the West Indian, Mexican, and Guatemalan) was recognized nearly three hundred years ago.

With the exception of the botanical description in Latin

published by Clusius in 1601, all of the above accounts were written in Spanish. The first mention of this fruit which has been found in an English publication is contained in Richard Hakluyt's classic volume, "The Principal Navigations, Voyages and Discoveries of the English Nation," published at London in 1589. Among the numerous documents included in this work is "A relation of the commodities of Nova Hispania, and the manners of the inhabitants, written by Henry Hawkes marchant, who lived 5 yeeres in the said Countrey, and drewe the same at the request of M. Richard Hakluyt Esquire of Eiton in the Countie of Hereford, 1572." Hawkes, whose relation is brief, does not describe the avocado, but says, "There are many kinde of fruites of the Countrey which are very good, as Plantans, Sapotes, Guiaves, Pinas, Alvacatas, Tunas, Mamios," etc. Nova Hispania (Nueva España or New Spain) was the name given to Mexico by the Spanish conquistadores.

In no account written during the sixteenth century is the avocado mentioned as occurring in the West Indies. Father Cobo, who wrote in 1653, observes that it obtained its name of aguacate from the Indians of Hispaniola, but makes no further reference to its occurrence off the mainland of tropical America. A curious work published at London in 1657, two years after the English took possession of Jamaica, contains a ~~brief~~ reference to its presence in that island. The work is entitled "A Book of the Continuation of Foreign

Passages." Under the heading "A brief Description of the Island of Jamaica," mention is made of "Avocatas, a wholesome pleasant fruit; in season in August, sold for eight pence per piece."

The first extensive description of the avocado in English, so far as known, was written by W. Hughes and published in a curious little work entitled, "The American Physitian, or, A Treatise of the Roots, Plants, Trees, Shrubs, Fruit, Herbs, &c. growing in the English Plantations in America." It bears the date 1672, and is reproduced below in full:

"Of the Spanish Pear.

This is a reasonable high and well-spread Tree, whose leaves are smooth, and of a pale green colour; the Fruit is of the fashion of a Fig, but very smooth on the outside, and as big in bulk as a Slipper-Pear; of a brown colour, having a stone in the middle as big as an Apricock, but round, hard and smooth; the outer paring or rinde is, as it were, a kind of a shell, almost like an Acorn-shell, but not altogether so tough; yet the middle substance (I mean between the stone and the paring, or outer crusty rinde) is very soft and tender, almost as soft as the pulp of a Pippin not over-roasted.

Place.

It groweth in divers places in Jamaica, and the truth is, I never saw it elsewhere; but it is possible it may be in other Islands adjacent, which are not much different

in Latitude.

Name.

I never heard it called by any other name than the Spanish Pear, or by some the Shell-Pear; and I suppose it is so called only by the English (knowing no other name for it) because it was there planted by Spaniards before our Countrymen had any being there; or else because it hath a kinde of shell or crusty out-side.

Use.

I think it to be one of the most rare and most pleasant Fruits of that Island; it nourisheth and strengtheneth the body, corroborating the vital spirits, and procuring lust exceedingly; the Pulp being taken out and macerated in some convenient thing, and eaten with a little Vinegar and Pepper, or several other ways, is very delicious meat."

Sir Hans Sloane, an eminent British naturalist, published in 1696 a catalogue of the plants of Jamaica, in which he listed, but did not describe, the avocado. He referred to many previous accounts, and made the observation in Latin: "The Avocado or Allegator Pear-Tree. It grows in gardens and fields throughout Jamaica." This, so far as has been ascertained, is the first time either of these names appears in print.

Later, in 1725, Sloane published an exhaustive work entitled "A Voyage to the Islands of Madera, Barbados, Nieves, St. Christophers, and Jamaica," in which was included

a natural history of ~~those islands~~ Jamaica. A chapter is devoted to the avocado, which is described as follows:

"The Albecato Pear-Tree, Hisp. Abacado, seu, Avocado.

This Tree has a Trunc as thick as one's Middle, with a light brown or grey ash-colour'd Bark, having very deep Furrows or Sulci in it, rising to twenty or thirty Foot high; the Ends of the Branches have a great many Leaves, standing without any Order on yellowish half Inch long Footstalks, they are three Inches long, and one and a half broad in the Middle, where broadest, very smooth and of a deep green Colour, with an Eye of yellow in it, having one Rib in the Middle and several transverse ones branch'd from it. Among the Leaves come out a short half Inch long Stalk, to which are fasten'd by short Petioli from near the Bottom, Flowers of a yellowish green Colour, to which follows a Fruit shaped like a Pear, as big as one's two Fists, greenish on the outside, having a smooth Skin and a Pulp under it of an Inch in Thickness, which is green, soft, almost insipid to the Taste, and very nourishing. Within this lies a naked great Kernel bigger than a Wallnut, having many Tubercles and Sulsi on its Surface, divisible into two great Lobes, between which lies the young Sprout or Germen.

It is planted and grows every where in this Island.

This is accounted one of the wholesomest Fruits of these Countries, not only by Way of Disert, being eat with Juice of Lemons and Sugar to give it a Piquancy, but likewise for supporting Life it self. It is useful not only on these Accounts to Men, but likewise to all Manner of Beasts."

There are, of course, occasional references to the avocado in the accounts of other voyagers during the seventeenth century; and it is included in the works of several European botanists written during that period. The latter, who were wont to copy from one another, sometimes inaccurately, add little to the history of the avocado and its distribution. The former are in most cases too brief to merit reference here; Benzoni, a very early voyager, described the avocado as a product of Nicaragua in 1565; Captain Sharpe, who sailed with Dampier, saw the fruit at Taboga island, in the bay of Panama, and mentioned it in a work published in 1680; Dampier himself described it briefly in 1685; and Ravenau de Lussan mentions it at Panama in 1689.

The Avocado

A greater variety of succulent fruits have come from the Tropics than from the Temperate Zones. Some of the most important - the orange, the banana, and the mango - are of Asiatic origin, and were unknown in the New World before the Discovery. On the other hand, tropical America gave the Old World the pineapple, the avocado, the anonas, the guavas, the sapodilla and numerous less important fruits.

While the pineapple is produced today in greater quantity over a more extensive geographical range than any other American fruit, the avocado has attained, during the past half century, commercial importance in many tropical and subtropical countries. The principal reason for this has been its unique character as a salad fruit. Less attention has been paid to its potentialities as a

food, a source of calories and certain vitamins. Here is where its greatest future may lies.

The Beginning of the Avocado

Archeological and other evidence proves that avocados were cultivated in Mexico, in Central America, and on the western side of South America in very early times. Just how early it is impossible to say - but perhaps as far back as 2000 or 3000 years ago. They were made known to the Old World through ~~~ is the first book published after the Discovery. This small volume, entitled the "Suma de Geografia" was written by the "bachiller" (meaning in old Spanish a man educated in law) Martin Fernandez de Enciso, who accompanied Juan de la Cosa on the first extensive exploration of the Spanish Main. This little book was published at Sevilla the year 1519, and Enciso describes a fruit which he saw in one of the small harbors ~~into which emptied a stream~~ which came down from at the foot of the Sierra Nevada de Santa Marta - quite possibly the ~~Gulf~~ bay known today as Don Diego. He wrote that the "resembles a large pear in appearance, but inside it is like butter, and of marvellous flavor."

In 1526, Gonzalo Fernandez de Oviedo described for the first time many of the plants and animals of the Indies. He praised the avocado which he had seen in Nicaragua, among other places. Here it was growing in the dooryards of the Indians, but the trees received no care, "for the only gardener was God".

In the mid-1500's, Spanish chroniclers wrote of the avocados of the highlands of New Spain, as Mexico was called at that time. Other early accounts tell of avocados in Nueva Granada (now Colombia) and elsewhere, but not in the West Indies. They were not known in the Islands until the Spaniards took them there. This strengthens the belief that avocado was not grown in the Orinoco region, whence had come the Caribs who moved into the Lesser Antilles in pre-Columbian times. Nor have we seen any records which show that avocados were known in the

Amazon basin, nor eastward in northern South America, nor anywhere to the south on the Atlantic side of the continent.

Garcilaso de la Vega, son of one of the Spanish conquistadores and an Inca princess, wrote in his classic account of the history of Peru, that the avocado was brought to the warm valleys near Cuzco (the climate of the Inca capital, at 11,000 feet, was much too cold for it) by Huayna Capac when he returned from his conquest of Ecuador about 1475. He had found it cultivated by the Palta Indians, who lived in the southern part of that country, and it is obvious that the common name palta by which the avocado is today known in Peru, Chile and Argentina stems from that source.

In modern times archeologists have unearthed avocado seeds from many tombs in the valleys along the Peruvian coast as far south as Nazca, which shows

this fruit was cultivated throughout that region long before the time of Huayna Capac. In all probability it was not native but has been brought southward from Ecuador.

Some of the early chronicles contain a few details regarding the size, or shape, or color of the avocados the authors had seen in Tropical America. The most valuable account is that of the friar Bernabe Cobo, who had Travelled widely and who obviously had an especial interest in this fruit. He wrote in 1653 that there are three kinds of avocados, and his description shows clearly that he is referring to what we call today the Mexican, Guatemalan, and West Indian races. When the horticultural classification was developed in the United States in the early years of the present century, no one was aware that Padre Cobo had recognized the three horticultural races of avocados 250 years earlier.

The wide range in geographic distribution of the horticultural races, their climatic adaptations, and characteristics of the trees and their fruits, have stimulated interest

in their origin, geographically and botanically. Much information has been accumulated through travel in Tropical America and through the study of herbarium materials available in the United States and elsewhere.

CHAPTER VIII

THE FRUTILLA

Just as the Capiton among the strawberries of Europe has received a distinct name, it seems to me highly appropriate to give one to the present variety in order to distinguish it from other strawberries of America, and I think we can not take a better one than that under which it is known in Chile: still from frutilla and frutillar we can make frutille and frutiller. Indeed These two races, Capiton and Frutille, are easily distinguished from other varieties of their respective continents by the separation of the sexes which we have observed. As for the rest, the frutille differs noticeably from the Capiton just as the scarlet strawberry does from the wood strawberry. Apparently, the influence of the same climate has produced similar changes in both, as one will see from the detailed description of their differences.

Its robust growth has made me regard the Fragaria vesca as the most perfect representative of this family. From a different point of view it should be the last of all, for it is the smallest. On this basis first place would belong to the frutille; it is the largest and most robust of known strawberries in all its parts, as well as the slowest in point of growth. I have seen several plants raised from seed reach the age of four or five years before flowering, and I have even seen young plants forming runners and early flowers until the second year: and not alone has this been evident from the few observations I have made upon the plant myself but it has been confirmed by Monsieur Frazier himself, who brought the frutille to France in 1716 and who has cultivated it since that time. The leaves of the frutille are scarcely larger than those of the cultivated wood strawberry but they are velvety, thicker, more leathery, and stiff. Also, they are not folded in the

bud like the last named, but only duplicate, this being one of their constant characteristics. The outer margins of two lateral parts are therefore rolled one upon the other. They attain this tendency when the leaves have unfolded and even more when the plant has need of water. The nervation, quite noticeable on the lower surface of the leaf, is scarcely so above, the membranes not having the wavy appearance shown on leaves folded in the bud. The shape of the leaf is also distinct in certain respects. It is much harder than any other strawberries; it is not pointed at the tip but is rounded like a racket: on the two lateral leaflets, the exterior half is much larger than the interior, especially toward the base, which is obcordate in form. The teeth, in outline, are more broad than rounded. The claw in which each terminates is quite large, but the red color is ordinarily not as bright. The leaves are brownish green in color like those of the scarlet strawberry, but they are quite pale below. Besides this, they are not so smooth. The thickness of the membranes and of the tissues renders them velvety.

The fruitlle makes fewer runners than other strawberries and, in consequence, the stems of its leaves are proportionately not long. I have seen them on several occasions bearing appendages like those of the green strawberry; runners are even larger and three times at least as long as those of the wood strawberry: it is not rare to see the first plants borne on runners at a distance of 18 inches from the mother plant. The flower stalks are almost woody; they stand erect, ordinarily divided into two branches which, subdivided into numerous pedicels, rarely bear more than 8 or 10 flower buds. The sheaths, which accompany these stalks, apparently do not give rise to leaves, as often happens in other strawberries. They are very large, in themselves green like the leaves.

All these parts are covered with long, whitish, stiff hairs which constitute one of the most notable differences. The upper surface of the leaves is less abundantly clothed than the lower. The stalks and calyces are most heavily so.

These differences have been noted by observing a few female plants. I have not yet seen any males, but analogy makes me believe that they are not any more different from the females than are those of the Capiton from the females of that species. Analogy also allows me to picture the conformation of their flowers. They should have strong stamens with slender filaments. As regards female flowers, I have seen several, all of which were uniform in character and agreed with those which Dillen has engraved.

The calyx is strongly developed, this not alone in the size of the divisions but also in their number. There are 7 or 8 large divisions in place of 5. The margins are cleft, each in three or four divisions, so that when in the bud they appear like scales. When the flower has faded, the calyx half closes and only the growing fruit forces it to reopen. The calyx lobes recurve, enclosing the base of the calyx. There are as many petals as there are major devisions of the calyx, sometimes more, for half double flowers are often seen: they are slightly concave, irregularly round, and gaudeonnes on the margins. As to their size, each is as large as an inside flower of the wood strawberry; calyx is of the same proportions so that the entire flower, therefore, is eight or ten times as large. The flowers, borne at the ends of the branches, are much smaller, but even so they are larger than any flowers of the Capiton. It is to this circumstance, I believe, that we can attribute the odor given off by the flowers of the Frutille, which is much stronger than that of other strawberries.

The Fruitilla.

Just as the Capitan has received a distinct name among the strawberries of Europe, it seems to me highly appropriate to give one to this variety, in order to distinguish it from the other strawberries of America, & I believe we cannot take a better one than that by which it is known in Chili itself: of Fruitilla. Fruitillar we can make Fruitille & Fruitiller. Indeed these two races of the Capitan & Fruitillen, each in its own continent, by reason of their having the sexes separate as which we have observed, are easily distinguished from the other strawberries which are hermaphrodite.

Moreover As for the leaf. the Fruitillen differs from the Capitan

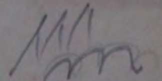
precisely as the scarlet strawberry differs from the wood strawberry. ~~It does not~~ apparently the influence of the same climate has produced similar changes in both, as we shall see by the detailed description of their differences.

Its robust growth has made me regard the "fraisier des mois" as the most ~~perfect~~ desirable; from another point of view, it should be the ~~last of all~~ least desirable, because it is the smallest; and then the first place would belong to the Fruitless; it is ~~the~~ ~~biggest~~ larger & more robust in all its parts than any of the known strawberries & is the slowest ~~growing~~ grower. Several have been known seen raised from seed, to reach the age of 4 or 5 years before flowering; never the young plants which

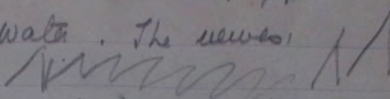
are ~~formed~~ made by the runners hardly ever flower before the second year'; I have already observed this in the few (of them) that I have seen. It has just been confirmed by M. Fagiére himself, who brought the Frutilla to France in 1716 & who has cultivated it ~~from~~ since that time.

The leaves of the Frutilla are hardly larger than those of the cultivated "Fraisier de bois" but they are much more substantial, thicker, ~~....~~ leathery & stiffer, also they are not ~~folded~~ plicate in the bud like the latter ~~....~~, but are only folded in two, this being one of ~~the~~ ~~invariable~~ constant characteristics. The outer margins of the two lateral parts are for this reason, rolled one over the other, they even retain this tendency to marked degree ~~strongly~~ when the~~y~~ leaves are unfolded & roll up again

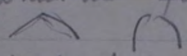
racoucir

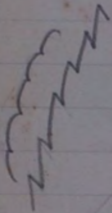


when the plant is in need of water. The nerves,



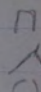
very prominent ~~underneath~~ these leaves, are hardly so above, their membrane not being creased as in leaves which are ~~folded~~ plicate in the ~~bud~~. The ~~shape~~ shape



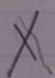


of the leaf has also some differences. It is much ~~more~~ ~~raccourcie~~ shorter than in the other Strawberries; the central (part) (leaflet) does not end

in a point, it is rounded like a raquette. in the two lateral leaflets, the outer half is as large again as the inner, especially at the base, forming with the two sides of



the stalk the shape of an inverted heart. The teeth present in



their contour look up inverto ~~[illegible]~~ aris rather than curve; they are thus less pointed; the specule which

terminals each one is rather large but the redness is not usually as bright. The leaves are, as to their colour browner green like those of the scarlet strawberry, but the lower surface is quite pale, besides they are not uniformly smooth; the thickness of the membranes of the parenchyma makes them, sort of in a certain degree, shagreen.

~~The leaves of the Fruitila are badly longer than those of the Fraisier de bois, but~~ cultivated

The fruitila make fewer runners than the strawberries; in consequence the leave stalks do not lengthen quite as much proportionately, but in vigour they quite come up to the others. I have seen them bearing on several occasions appendages like those of the

green Strawberry. The runners are even thicker
& at least three times as long as the runners of the
wood Strawberry; it is not rare to see the first plant
of these runners borne at 15 or 18 inches from the
old crown. The flower stalks are almost woody;
they stand erect usually divide into 2 branches
which are subdivided into several pedicels, rarely
bearing more than 8 or 10 flower buds. The sheaths
which accompany these branches ~~do not~~ never seem to
bear leaves as often happens in the other Strawberries;
they are simply very big & green & like leaves

~~Strawberries~~

All these parts are densely covered with long
white hairs which constitutes one of the most

obvious
~~notable~~ differences; ~~as~~ the upper surface of the leaves is much less abundantly ~~clothed~~ covered than the rest of the plant; the stems & ~~flower~~ calices are most heavily so.

These differences ~~are not~~ have only been taken from a few ~~individual~~ female plants. I have not yet seen any males but ~~the~~ analogy makes me believe that they do not differ more than the male

Capitons ~~differ~~ from ~~the~~ females. Analogy capitons.
also allows me to guess at the conformation of the flowers: they ought to have very ~~small~~ large stamens with a small ~~placenta~~ receptacle. As regards the females, I have observed several of them, all of which were uniform in character agreed with those which follow.

has engraved.

The calyx is strongly developed, not in the size of the divisions but in their number; there are 7 or 8 ~~big~~ large ones in each of 5; the outer ones are cleft again, each one into 3 or 4, so that they resemble scales, being united to form the bud. When the flower is open, this calyx half closes up again: it is only the fruit which in swelling forces it to reopen. The divisions stand out from it, ~~enclose~~ clasp it - support it at the base. There are as many petals as large divisions of the calyx, often more, because many half double flowers are found. They are slightly concave, not perfectly round with slightly ~~undulate~~ ~~sinuous~~ margins. As to their size, each one when spread out

April 23th

it as large as a whole flower of the fraisier de bois; also the calyx is in the same proportion, so that the whole flower is in this way, about 10–12 times as large. The flowers borne at the end of the branches are often not nearly so large; but even ~~then~~ so they ~~would~~ ~~still~~ larger than any of the flowers of the Capelton. It is to this circumstance, I believe, that we can attribute the odor given off by the flowers of the tertillas which is much stronger than those of the flowers of other strawberries. The space which is found between the petals & the base of the receptacle ~~axes~~ axis, is proportionately greater than usual; also the ~~blade~~ ~~receptacle~~ thalamus (?) bears a much greater number of (~~hairs~~ ~~fibres~~ filaments ?); there are 40 or 50 close together, in 3 or 4 ~~moved up~~ confused rows

& pouring in all directions.

In the female plants which I have seen, these filaments were very strong the anthers absolutely abortive, like those in the female Capitons.

The young ~~receptacles~~ ~~caps~~ receptacle, on the contrary, were very large; equally little wood strawberries; always of the same shape; flat, however on one side, so that their form is oval. Numerous ovaries, rather large, with proportionately long styles, cover these receptacles.

The stamens of these female flowers are not fertile; usually they are abortive like those of the female Capitons: I have seen quite a number of these; in which neither the receptacle nor the ovaries when

develop, but dry up & disintegrate little by little. There are undoubtedly the male plants of the same race which should fertilise them. but in their absence, I saw, last year I saw that some male Capilons fitted performed this function perfectly.

The fruits have become a attained a considerable size, in proportion to that of the flower; too but not so large however as they are in Chili in the country of the Tutilla. M. Fegiér, who has seen plenty of them, says that they are founds as big as hens eggs & usually like fine walnuts. In France, the Tutillas seem generally a little smaller less than their natural size; however

166 – 176
176 – 189

M. de Rouelles Grou, who raised some for a few years at Cherbourg. as I said above, obtained in 1764, two among others. which he found to be 7½ ins in circumference; the fruits that I have seen were ~~the size~~ as big as of a medium sized apricot; the flesh is solid the others were smaller, like that of Caprons. The ovaries, although far apart from one another, only form light cavities. They are at ~~double the size~~ twice as big as of those of Capeton & 3 or 4 times those of the common strawberries: their color is a rather dark red, but not of a very bright shade. The skin which covers the rest of the fruit, becomes on ripening the same color above & a yellowish white underneath.

it is very shining all over. The ~~odor is~~ very agreeable odor is much like that of Fraise ananas. The flavor is also similar to that variety as far as I can judge from a very imperfect abortive fruit, ~~the~~ only one which I have been able to taste. M. Frezin, who has eaten ~~them~~ in Chile, says that these Frutillas are a little less delicate in flavor than our strawberries. However those which I have just described, are here found to have possess a delightful perfume. Could the influence of the climate have effected this happy change?

I have already said that the Frutilla seems to owe its origin to the Capiton; in both races ~~the position of the~~ sexes are separated on ~~the~~ different plants, male & female. ~~As to the characteristics~~ Except in this ~~Furthermore~~ they only differ from each other in characters which

belong to each of these ~~species~~ the other species of the continent ~~It is this difference, which ... ~~ by

~~Owing~~ to this resemblance which caused me to place

the two pots in my collection side by side, is due the

lucky chance of cross pollination, of which I have just

spoken. I shall remark further by the way ~~that~~ that this

~~instance~~ is almost the only authentic case in

the natural history of plants, although for some

time people have been incessantly talking of crossing

in different species; that the seeds, resulting

from this fertilization, which I have sown, should

produce a new & hybrid race, which will

~~determine~~ show in what respect the crosses resemble

their father & mother. The observations may become

very interesting in natural history, to help to ~~decide~~

Solve the much ~~debated~~ vexed questions of day [question so ~~debated~~ discussed today]

concerning the value of Crosses & hybrids. the formation of new species, ~~transmut~~ their transmutation etc etc. The study which I have undertaken to make of several modern methods of attaining these results, has led me to realise the inaccuracy of these observations & the inconsistency of the ~~conclusion~~ inferences which one ~~wh~~ would like to draw from them; it is ~~in order~~ for the purpose of ~~exposing them~~ showing them up & of submitting my ~~observation~~ suggestions to the judgement of the public that I will give ~~the~~ it in detail in a "a fourth special Remark"

~~Th~~ In this here as in all the other, in order to

know them well they should be observed in the place where they grow, or at least seen when taken from their country in a fresh state; independently of the knowledge of them that botany will acquire practical gains will also be made, as I shall have occasion to say in the following pages. The Fraisier de pres. which is found in Sweden which as I have already said should be the Capiton in its wild state, seem however perfectly hermaphrodite. as I shall say in the observation containing its history; there could be then the Caption which has not become degenerate the Fraisiers which are cultivated in Chili are perhaps similarly hermaphrodite; perhaps the

the change of climate ~~to have been able to~~ might have caused the defect we have noticed. In order to settle this question it would be important to bring from Chili fresh seeds of the fertilia, or still better living plants; those who will undertake to do this would render an invaluable service both to horticulturists cultivators & to naturalists. But supposing, & it seems reasonable how to do so, that the separation of the sexes, or at least of their fertility, is natural both in this race & in Capsicum, it is very probable that the former has been derived from the latter. Moreover. I absolutely do not know by what means Capsicum could have entered Chili, in order to

become the Fuchsia. I only know that it does not seem natural. In fact, M. Frazier, in the ~~account~~ observations on his voyage to the South Sea do not say that it grows in Chili; he says only that it is cultivated in whole fields in the neighborhood of the town of Conception on Penco, 36°45" south latitude; & according to the letter he has kindly written me from Brest, on ~~the~~ 18th November last, he adds that ---- with these few plants thus distributed, the Fuchsia was not slow to spread throughout Europe.

M. Frezier has also ~~reported~~ brought back from his trip a drawing made by himself from

life, an engraving of which he has given in his account. The plant is ~~larger than~~ life size, on the ground; its 4 or 5 leaves are rather small; they are very faithfully ~~rendered~~ portrayed, though the nervation is not shown well enough: the stem bears only the two primary fruits which are very large: the rest had obviously been punched off; the calyces were not drawn so correctly; the leaf cloth which accompanies the stem has been forgotten; but a much more serious omission is that of the flowers, Dr. Fraser having represented his fruitful in the fruiting stage only. We cannot, for this reason if this fertile plant was a perfect hermaphrodite or

only a female as I suppose
It would be also necessary ascertain
~~It also failed to find out~~ if the five plants
brought to France were all females, or if, on
the contrary there were any males or even
hermaphrodites. In this last event, which
it seems to me quite natural to imagine,
all the Fuchsias produced by propagation of cuttings
from the first plant, being like it perfectly
hermaphrodite, would bear fruit ~~constantly~~
regularly, while the others would be sterile
And supposing there were male & female plants

But if

But if we believe, as seem reasonable ~~to do~~, that the specimens brought by M. Frezier had all been fertile, that to say females ~~ready~~ fit for fertilisation; it they would necessarily be found sterile everywhere where they were isolated; they could only have been fertilised in being mixed with other staminey plants ready to pollinate them, like male capitons. Then these hybrid ~~grains~~ seeds would produce male fertiles as well as females, & natural ~~fertil~~ fecundity would be re-established

Perhaps, again, there still does not exist in Europe any male specimen of the Fontilla; in this case, the fertility of the female must always depend on cross pollination. We have not yet enough historical accounts to form an decided opinion; but the little that we know agrees very well with this last conjecture.

The specimen left in the jardin du Roi was female; I have seen some flowers preserved in Vaillants' Herbarium. ~~It is from plants sowed~~ Some plants from these seeds have been sent to Leiden, from this some went to England, to Ellham, according to Dillen, who has made an engraving? of female & sterile one. Dr. Dillen says that

today the cultivation of it in England has been abandoned, because of this sterility: they do fruit there, however, in certain places. There were also some which gave fruit 3 or 4 times in Paris (?) in the garden du Roi & house of several curiosities. Blot, the late professor of the botanic garden at Caen, has brought several Frutillas in perfection: he owed them to cross pollination, as he says himself — M. des Rouelle - Gron has done the same thing at Cherbourg for several years; & I have just succeeded also. Chance might well have brought about similar cross pollination, without its having been observed. Finally Frutillas are reported to fruit regularly at Brest; "this town & its environs are so well provided

with them that they can be bought in the market:
but M. du Hamel ~~too observed~~ himself saw that
in 1764 in the best ? plantations, half of the
strawberries were quite different & in that country
were called fraisier de barbarie. He brought some
back to his country & I have received some plants
from him: they are ~~scarlet~~ fraisiers écarlates &
Capitons: it is not surprising if ~~fragaria~~ Frutillas
do fruit there: it is again through cross
pollination: & from this time onward there
should not be more sterile plants that we want.
I have said that Dillen has shown a female
plant of Frutilla, engraved by himself: it is in his
magnificent collection of plants of Eltham Gardens

in England. The ~~gr~~ ~~dr~~ engraving is wonderful admirable, & scrupulously exact in depicting the hairs & smallest nerves. The plant is life size but much bigger than ~~that~~ Frezier's. it consists of 7 fairly large leaves, & of a stem ~~stalk~~ which bears an open flower & 5 buds, all the sheaths are ~~in~~ shown, but those of the stem are not accurate ~~correct~~: the calyces are luxuriant, as in the flowers that I have seen: they have 7 petals; the receptacle or at least the bunch of styles & the arrested stamens on the periphery are portrayed with the greatest accuracy.

Boerhave saw ~~has seen~~ this plant at Leiden. When he has published the catalogue of plants of the ~~town~~ botanic garden of that town, but it was without

flowers, & ~~then as it is shown~~ it is shown like this.

M. Miller has made of the Frutilla a fourth ~~species~~

of strawberry; he distinguishes it by the oval ~~leaves~~,

fleshy, & shaggy leaves & by its very large fruit.

~~It~~ It is also contained in ~~the~~ ~~ed~~ Linnaeus's collection

of species he has placed it there as a ~~third~~ variety

of Strawberry

M. Frezier has called the Frutilla by the name of

Chilian Strawberry & it is still commonly known by

this name. There is in the Agrémens de la

campagne published by the Court a number of

Fraises de Surinam of an extraordinary size, & known

for some years in Holland, according to what is

says at the beginning of the century. They cannot be

the Fusilla, but the name is not at all appropriate