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*About the Institute*

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

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.

Research Department  
La Lima, Honduras  
November 1, 1939

Mr. W. L. Taillon:

During the past week I have gone over the Panama Disease situation in the Guatemala West Coast farms with Mr. McKinnon and others. We visited practically all the disease sites in Peten Farm and observed the method of control being employed.

Up to date there have been around 180 cases of Panama Disease observed and treated. With the present method of treating the 8 mats immediately surrounding the diseased plant, I understand the cost of treating each new case runs between \$50 and \$60.

Although there is little or no proof of any benefit from similar treatments in other divisions or other countries ever having been obtained, I think we all feel that the first cases of Panama Disease appearing in a new farm and especially in a new division should be destroyed and all possible quarantine steps taken to slow up the subsequent spread. There comes a time however in all farms where the cost of such treatment increases to a point where such work has to be simplified and cheaper methods used.

It would be impossible to completely sterilize all the soil around and under a diseased plant by any chemical means known. Besides when one mat shows up with Panama Disease we can be sure that there are other mats, perhaps long distances from this one, already infected with the fungus but which have not yet shown the symptoms. We have frequently noticed in resistant soils that untreated mats of Panama Disease may stand for one or even several years with no infection occurring in adjacent plants although steady spread of the disease continued in the surrounding area. This would seem to disprove the original theory of Cousins and Smith in Jamaica that spread of infection was usually through root to root contact.

It is my personal opinion that the one mat treatment should be employed hereafter in Peten Farm, using the oil and formaldehyde as in the past. In the other farms as the first cases show up and where all concerned are interested in doing the utmost to slow up initial spread regardless of cost, the eight mat treatment could be continued for the time being.

One day was spent with Mr. King in looking over some of the banana cultivations in the Mazatenango - San Felipe area. A number of the Panama Disease locations were observed. The spread of disease in the Ramirez property near Mazatenango (San Jose el Compromiso), first observed by Permar in 1936, looks rather rapid to me. In most other cases, advance has been slow.

Excellent control of Sigatoka was observed throughout the Tiquisate Farms even where spraying had been discontinued for several months during the dry season. Control is evidently much more easily obtained under the conditions prevailing there than here in Honduras and it should be possible to maintain it at considerable less cost.

The severity of Sigatoka in the Mazatenango - San Felipe area is still somewhat patchy. Many farms are practically out of production, others moderately affected and some upper farms fairly clean. Shade is an important factor in the mixed coffee - banana cultivation but eventually I feel that only such mats as are completely under

shade will produce good fruit. The presence of many thick topped trees scattered through a plantation slows up the progress of Sigatoka very markedly while banana plants immediately under such trees usually show spotting on a few lower leaves only.

(Signed) V. C. Dunlap

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Bananera, Guatemala  
October 31, 1939

Mr. W. E. Turnbull:

Since writing you on October 10th in regard to status of Panama Disease cases on our West Coast Farms additional cases have now been discovered. For your easy reference, I am listing below status of diseased mats by farms as of October 7th and as of October 28th:

	As of <u>Oct. 7</u>	As of <u>Oct. 28</u>
Peten	175	186
Izabal	19	22
Verapaz	2	2
Santa Rosa	13	19
Jutiapa	2	4
Tecpan	<u>7</u>	<u>9</u>
Total	<u>218</u>	<u>242</u>

(Signed) D. E. Rayer  
for H. T. Heyl

Copy to: Mr. A. A. Pollan

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Food Production and Losses of Veterinary Farm - years 1933, 1934 and 1935

(1933 land)

	Young calves born up to July						July		July				Total	
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
1933														
Milk														
Manure														
U.S.P.														
Food losses														
Washed residues														
1934														
Milk	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500
Manure	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700
U.S.P.	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Food losses	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800
Washed residues	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900
1935														
Milk	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100
Manure	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300
U.S.P.	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Food losses	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400
Washed residues	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500

November 15, 1939

VIA AIR MAIL

Dr. Wilson Popenoe  
United Fruit Company  
Kingston, Jamaica

Dear Doctor Popenoe:

The spread of Panama disease on the West Coast of Guatemala has reached considerable proportion especially in Peten Farm, as you will note from the attached copy of Mr. Heyl's report dated October 31st.

I am enclosing copy of a memorandum from Doctor Dunlap in which he suggests that on account of the extensive spread in Peten we abandon the eight mat treatment and revert to the one mat treatment with Diesel oil in that farm, continuing for the time being the present methods of treatment in the remaining farms. I am inclined to agree with Doctor Dunlap's recommendation but I feel that this matter is so important that we should all be in agreement and I am therefore asking you for your opinion before giving instructions to Mr. Heyl to make any change in the method of treatment.

Please let me have your comments by airmail as soon as possible.

Very truly yours

*A. C. Pollard*

Enclosures

Copies to: Mr. H. Rowe  
Mr. W. E. Turnbull  
Mr. H. T. Heyl  
Dr. V. C. Dunlap

# UNITED FRUIT COMPANY

GENERAL OFFICES, ONE FEDERAL STREET, BOSTON, MASS.

INLAND TELEGRAPH ADDRESS  
"SANANAB"

THOMAS BRADSHAW  
MANAGER

JAMAICA DIVISION  
Kingston, JAMAICA

18th November, 1940.

VIA AIR MAIL

Mr. A. A. Pollan,  
Executive Vice President,  
United Fruit Company,  
Boston. Mass.

Dear Mr. Pollan,

I refer to Mr. Bradshaw's letter of May 14th, 1940,  
and forward herewith copy of a further memorandum by Mr. Butler  
dated November 15th, in regard to his investigations of Cercospora  
which I am certain everybody concerned will find very interesting.

Yours very truly,

*ECN*  
[ECN Hislop?]

Copy to Mr. W. E. Turnbull  
Dr. W. Popenoe ✓  
Mr. V. C. Dunlap

Enclosure.

Cedar Grove Experiment Station,  
Gregory Park P.O.

November 15th, 1940.

C.N.Hislop Esq.,  
Acting Manager,  
United Fruit Company,  
Kingston.

Dear Mr.Hislop:

Asco spore Type of Cercospora Musae

On May 11th we wrote Mr.Bradshaw describing another means of distributing *Cercospora musae* - a sclerotia type growth. These we had found in our cultures and also on dried up leaves affected by *Cercospora musae*. Recently Mr.Leach, the Leaf Spot Pathologist at Hope, has isolated from affected leaves from the Frankfield area of Jamaica what we think is asco spore type of *Cercospora musae*, and it seems probable that the bodies that we described on May 11th may have been immature perithecia of this same type.

Fungous parasites have several means of distributing themselves. The two main types of spores are the conidia which correspond to "Cuttings or slips" in higher plants and are the vegetative or asexual form, and the Asco spores which correspond to the seeds of higher plants and are formed as a result of sexual fusion of the male and female cell. This sexual form has often been listed as a separate fungus and frequently when a new disease shows up only the Conidial form of spore is seen. In such cases the parasite is listed as an Incomplete Fungus or under Fungi Imperfecti. *Cercospora musae* is listed there today.

The asco spores are produced in an ascus or sack which usually contains 8 spores, and several of these asci are contained in a large thick-walled cell known as a perithecium. These spores differ from conidia in that they can withstand severe changes of temperature and

humidity while they are still enclosed in the perithecium, and also that when the time is correct for their dispersal a special mechanism in the perithecia causes them to go off like a miniature bomb and scatter the spores in all directions. Conidia spores on the other hand have to be dislodged by some outside agency like water, insects, birds, etc., before they can spread around.

So far we have not been able to find definite proof of perithecia or asco spores on our St. Catherine cultivations, but I have no doubt that we shall do so at some period of the year. In many other fungous parasites the formation of asco spores is definitely seasonal. This discovery may not greatly change any control procedure except that if we can time the arrival of these asco spores we may be able to pay particular attention to our spraying at that period. It may also pay us to remove dry trash from the trees during this period. We shall continue to look for asco spores in St. Catherine.

Regarding the samples from Frankfield, Mr. Leach has isolated cultures grown from these two-called asco spores, and these cultures have produced conidia which correspond in every way to *Cercospora musae*. Moreover, his cultures when grown on the Cedar Grove Banana Leaf agar appear to be identical to these we have obtained from conidia. He has now taken the conidia produced in culture from this asco spore and inoculated bananas. The final proof will show up when he gets normal *Cercospora musae* lesions which produce conidia on the banana leaf say in 2 to 3 weeks time. I have no doubt about their arrival.

This information should be of value to the company in Central America and may explain some of the unusual spreads that have shown up in



different areas at different times of the year. The following descriptive material by Mr. R. Leach may be of value to our Research workers in Central America in identifying this type :

Perithicium	Diameter	51 to 67 mu
Asci	Length	30 to 37 mu
	Breadth	10 mu
Asco spores (Hyaline 1 - septate)	Length	12 to 17 mu
	Breadth	3 to 4 mu
	Constriction	- slight

Paraphyses none

The perithecia are found on both upper and lower surface. So far they have not been seen in large numbers but this may be due to a seasonal feature.

I will endeavour to obtain Photo micrographs of this material at first opportunity.

Yours sincerely,

*Alfred S. Hitchcock*

Research Department  
La Lima, Honduras  
November 25, 1940

Mr. W. E. Turnbull:

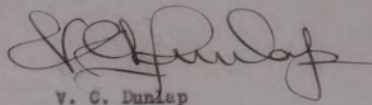
Re: Panama Disease control measures being carried on in Company and Independent Farms on the West Coast of Guatemala.

When Panama Disease first showed up in that division, we all agreed that every possible step should be taken to eliminate it and to slow up its spread. As you know, the first infected mats plus nine surrounding ones were destroyed, the area ditched and fenced and the soil treated with heavy doses of formaldehyde. In spite of these precautions, cases of Panama Disease have continued to show up throughout the division, and there is no longer a possibility of elimination or even of limiting the infection to certain farms or sections. I believe some \$25,000 to \$30,000 have already been spent in this control work and to continue it will entail much greater expenditures.

It is my opinion that this method may be justified in the first few cases in any farm. After that I feel the ordinary method of oil treatment could be adopted with as good results and much less expense.

In regard to Independent Farms, certain planters are now destroying and ditching around each diseased mat in order to eliminate spread by surface irrigation water. Although personally I do not believe this is very effective, since doubtless the organism is already present well outside the restricted area, I see no objection to continuing it in the first ten or twelve diseased mats in a section. It costs but little and apparently gives all concerned a feeling that something is being done toward control. I would suggest that the mats be killed with diesel oil and the trash piled up. All dirt should be heaped on the inside of the ditch.

Where disease is more frequent, I believe the usual one mat oil treatment should be adopted in independent farms.



V. C. Dunlap

*Dr. Popincove*

Research Department  
La Lima, Honduras  
November 25, 1940

Mr. W. E. Turnbull:

During the past two weeks I have had opportunity to observe the "red spider" infestation on the West Coast of Guatemala in both Company and Independent farms.

On my arrival there, November 11th, we found severe red spider infestation over a large part of Tecpan Farm and a considerable amount in other scattered areas in the division. We visited Velasquez Farm and found very slight scattered infestation. Injury from the previous infestation had largely cleared up and no new damage was evident.

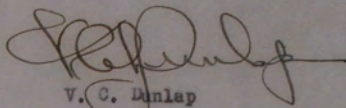
At Tecpan Farm, we experimented with various insecticides, by carefully spraying individual leaves and plants and observing immediate effects. We found that either kerosene or diesel oil emulsion gave excellent control.

In view of the fact that the infestation was becoming more severe day by day and that the area affected was spreading, it looked as though considerable injury to plants and the subsequent fruit crop might follow. It was decided to spray some 400-600 acres with one application of a 2-4-100 Diesel oil emulsion (2 gals. oil, 4 lbs. soap, 100 gals water). Before this application was made, however, and about a week after my arrival, the insects suddenly began to disappear. Within a few days (November 22) only rare living mites could be found, the under surface of the leaves being covered with the dead remains.

In view of the resistance of these spiders to nicotine sulfate, it is believed a similar destruction from natural causes occurred at Velasquez Farm. Since only a few lady bugs and their larvae were found destroying them, there is probably some bacterial or fungous organism responsible.

In the future, I believe we should watch similar infestations carefully, but unless recurrences are frequent, or outbreaks more severe, I doubt if control measures will be warranted.

I do not believe this "red spider" or mite is the one common on citrus and other fruit trees in the United States and parts of the tropics. It is a light yellow green color and shows none of the red coloration of the common red spider.

  
V. C. Danlap

REPORT ON A BRIEF RECONNAISSANCE OF COMPANY  
LANDS EAST OF THE MADRE VIEJA - GUATEMALA WEST COAST  
NOVEMBER-DECEMBER, 1940

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Development of our lands on the Guatemala West Coast has so far been limited to the area between the Nagualate and the Madre Vieja, - that is to say, Concepcion la Grande. East of the Madre Vieja we own a large area made up of Zapote, La Gironda, Garrucha and numerous smaller properties.

The plantings made on Concepcion la Grande have now attained sufficient age to give us an idea of the relative merits and behavior of the soil types involved. In the light of this information it has seemed desirable to take a look at our properties east of the Madre Vieja. This was done by H. H. Hutchings and myself in the latter part of November and the first days of December, 1940.

So far as we can ascertain from an examination of the information in our files, no detailed soil survey has been made of any area owned by us east of the Coyolate river, with the exception of Zapote, which was included in the soil survey made about 1929 by Garth W. Volk. There is an exploration map of the West Coast in the Tiquisate files on which are shown a few borings on La Gironda, Garrucha and other areas east of the Coyolate. So far as my own recollection goes, we have no details regarding soils of this area.

Mr. Hutchings and myself made two brief trips -- the first on horseback, the second by motor truck with don Fernando Pullin. On the first trip we left the overseer's house at Jocoten farm and rode through La Noria to Concepcion, Paso de Mogoyon, Santa Ana Mixtan and La Garrucha. On the second trip we left the railroad station of Obispo by truck and proceeded through Democracia and La Gomera to San Jeronimo where we made our headquarters. From San Jeronimo we made one trip in a northwesterly direction to the border of Garrucha - a second trip westward through La Gironda to Zapote and the area on both sides of the Coyolate River. Occasional soil borings were made, the results of which have been placed on the accompanying map.

In any area where soils are so "patchy" as on the Guatemala West Coast, scattered soil borings do not tell much of a story. Their main value in this case lies in the confirmation they give to our general observations on the region traversed.

In making this reconnaissance we particularly had in mind two points: We desired to determine whether or not large areas of comparatively heavy soils are to be found east of the Madre Vieja, and we desired to determine whether or not the soils of this area are in general deeper than those on which we have worked on Concepcion la Grande. These two points we consider are of particular interest in connection with the future of Panama Disease in our Guatemala West Coast plantings.

Our first trip - that from La Noria to Garrucha and return - was somewhat disappointing. We had been told by several people that Pacayas, a property of considerable size lying close to Garrucha, was characterized by excellent soils. We did not find this to be the case. The surface soils are fine, sandy loams and clay loams, but are shallow in all cases observed by us; in fact, most of the borings made by us between the Madre Vieja and Garrucha were satisfactory at the surface, but ran into sand or fine sand at 12 to 24 inches. Our experience on Concepcion la Grande shows that such soils will require a great deal of irrigation and there is the added circumstance, more important - that we believe these shallow soils to be dangerous from the standpoint of Panama Disease spread.

One or two borings southeast of the house at Garrucha were fairly satisfactory. Aside from this area, we were disappointed in the depths of the soils east of the Madre Vieja, as has been stated above. This is not saying that they should not someday be planted; a detailed examination would undoubtedly bring to light considerable areas of satisfactory character, but in general we feel that this is an area which is definitely inferior to others available at present.

Our second trip, starting from Obispo on the I. B. C. A., took us into Company property near the southeast corner of our holdings. La Gironda is a large tract of which very scanty information has been available. It seems to have had a bad reputation due, we believe, to the lack of water. This would be of importance to any one concerned with this property only, but from our standpoint means little, since we have control of the area between this farm and the Coyolate, and would bring water from the last named river. Zapote has always been considered by us a good property. Garth Volk soil mapped this farm completely, and if I recall correctly, he thought well of it.

We did not get into the center of La Gironda, but were favorably impressed by what we saw on the north and south sides of the property. Particularly on the south boundary, most of the borings were highly satisfactory. The soils of this area have good depth and impress us as first-class banana lands.

The cross-section of the Coyolate river deposits which we were able to see also left an excellent impression. Judging from this brief glimpse we are inclined to feel that the Coyolate deposits are fully as good as those of the Negualate on which we are working at present. Indeed, we felt that they might be even better.

We did not, however, obtain the impression that there are any large areas of heavy soil in the region traversed, nor any large areas of soil types with which we are not familiar on Concepcion la Grande. We gained the impression that we have particularly on both sides of the Coyolate, and in La Gironda and Zapote, large areas of very satisfactory soils which eventually will prove highly valuable to the Company.

The future of this area - as of our West Coast development in general - depends to a large degree upon the behavior of Panama disease. This factor we consider far more important than the wind hazard.

We do not believe it is too early for definite steps to be taken looking toward the protection of these areas east of the Madre Vieja. Panama disease is spreading steadily over the coast, and in a few more years it will be impossible to obtain seed which we can with confidence assume to be free of infection. Obviously, areas planted now or in the future may become infected even if clean seed is used, but we consider that it would be an inexpensive and extremely valuable move to establish in the spring of 1941, a small seed bed east of the Madre Vieja, with a view to having clean seed for later use in the region we have been discussing.

If this seed bed is planted in Gironde or Zapote, and if it becomes infected before we have use for the seed provided, obviously we would lose more than we would gain, for we would have established Panama disease in an area where it might rapidly spread to our new plantings. But if we establish this seed bed in an isolated spot not likely to be included in any future large scale plantings, we stand to lose nothing if it becomes infected, and on the other hand we stand to gain a great deal if we succeed in building up during the next three or four years, several hundred acres of clean seed. We consider that some such spot as Concepcion on the east bank of the Madre Vieja where Dr. Palm made an experimental banana planting about 1926 (of which scattered mats are said to still be in existence) would be the right sort of place. By choosing an area of deep soil we do not believe it would be necessary to incur the expense of providing irrigation. It will be recalled that our 120 acre experimental planting some 5 kilometers below Tiquisate persisted without irrigation between 1932 and 1937, when it was dug for seed. The control of Sigatoka would be an essential but could be handled easily with a portable, such as one of the Hardie XV's used in Jamaica.

Even if development of the Gironde-Zapote-Garrucha area is delayed for



many years, we feel that the development of seed beds at some such place as Concepcion would be highly advantageous to us, providing we succeeded in keeping them free of infection. Provision of disease free seed, even on a relatively small scale, is a matter worthy of serious consideration at this time.

Tiquisate, Guatemala  
December 27, 1940

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LANDS EAST OF THE MADRE VIEJA - GUATEMALA WEST COAST  
NOVEMBER-DECEMBER, 1940

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many years, we feel that the development of seed beds at some such place as Concepcion would be highly advantageous to us, providing we succeeded in keeping them free of infection. Provision of disease free seed, even on a relatively small scale, is a matter worthy of serious consideration at this time.

Tiquisate, Guatemala  
December 27, 1940

COMPANIA AGRICOLA DE GUATEMALA

Tiquisate, Guatemala

December 27, 1940

Mr. W. E. Turnbull  
Assistant Vice President  
La Lima, Honduras

Dear Mr. Turnbull:

Herewith is transmitted a brief report on the reconnaissance made by Mr. Hutchings and myself of Company lands East of the Madre Vieja, Guatemala West Coast.

I would like particularly to call your attention to our recommendation that we attempt to develop somewhere in this region, a supply of Panama disease free seed. We believe it will still be possible to get clean seed in the area above Coatepeque, but every year the chances are growing less.

We would suggest a planting of 50 to 100 acres during the spring of 1941 to be enlarged later as experience may suggest, and we recommend that no irrigation be provided, for two reasons: (1) the work of laying pipe through the area would increase the chances of bringing in Panama disease at the start, and (2) we feel that letting the area suffer a bit during the dry season may serve to discourage the development of Panama disease. While we realize that somewhat better seed would be obtained if the planting were irrigated regularly, the 120-acre experimental planting established in 1929 five kilometers below Tiquisate had no irrigation for six or seven years, yet turned out a large quantity of fairly good seed, completely free of Panama disease, when dug for planting our new farms in 1936.

While we realize that the proposed seed-bed may become infected - in which case little would be gained from the investment - we think the

Mr. W. E. Turnbull - 2

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An isolated area, such as that suggested, would not endanger the future of our lands east of the Madre Vieja; and if we get clean seed we will have good use for it on new farms to be planted along the Mahualate, even if we do not open up the Coyolate area in the next ten years.

Yours very sincerely

Wilson Popenoe

cc: Mr. A. A. Pollan



REPORT ON A BRIEF RECONNAISSANCE OF COMPANY  
LANDS EAST OF THE MADRE VIEJA - GUATEMALA WEST COAST  
NOVEMBER-DECEMBER, 1940

Development of our lands on the Guatemala West Coast has so far been limited to the area between the Nagualate and the Madre Vieja, - that is to say, Concepcion la Grande. East of the Madre Vieja we own a large area made up of Zapote, La Gironda, Garrucha and numerous smaller properties.

The plantings made on Concepcion la Grande have now attained sufficient age to give us an idea of the relative merits and behavior of the soil types involved. In the light of this information it has seemed desirable to take a look at our properties east of the Madre Vieja. This was done by H. H. Hutchings and myself in the latter part of November and the first days of December, 1940.

So far as we can ascertain from an examination of the information in our files, no detailed soil survey has been made of any area owned by us east of the Coyolate river, with the exception of Zapote, which was included in the soil survey made about 1929 by Garth W. Volk. There is an exploration map of the West Coast in the Tiquisate files on which are shown a few borings on La Gironda, Garrucha and other areas east of the Coyolate. So far as my own recollection goes, we have no details regarding soils of this area.

Mr. Hutchings and myself made two brief trips -- the first on horseback, the second by motor truck with don Fernando Pullin. On the first trip we left the overseer's house at Jocoten farm and rode through La Noria to Concepcion, Paso de Nogoyon, Santa Ana Mixtan and La Garrucha. On the second trip we left the railroad station of Obispo by truck and proceeded through Democracia and La Gomera to San Jeronimo where we made our headquarters. From San Jeronimo we made one trip in a northwesterly direction to the border of Garrucha - a second trip westward through La Gironda to Zapote and the area on both sides of the Coyolate River. Occasional soil borings were made, the results of which have been placed on the accompanying map.

In any area where soils are so "patchy" as on the Guatemala West Coast, scattered soil borings do not tell much of a story. Their main value in this case lies in the confirmation they give to our general observations on the region traversed.

In making this reconnaissance we particularly had in mind two points: We desired to determine whether or not large areas of comparatively heavy soils are to be found east of the Madre Vieja, and we desired to determine whether or not the soils of this area are in general deeper than those on which we have worked on Concepcion la Grande. These two points we consider are of particular interest in connection with the future of Panama Disease in our Guatemala West Coast plantings.

Our first trip - that from La Noria to Garrucha and return - was somewhat disappointing. We had been told by several people that Pacayas, a property of considerable size lying close to Garrucha, was characterized by excellent soils. We did not find this to be the case. The surface soils are fine, sandy loams and clay loams, but are shallow in all cases observed by us; in fact, most of the borings made by us between the Madre Vieja and Garrucha were satisfactory at the surface, but ran into sand or fine sand at 12 to 24 inches. Our experience on Concepcion la Grande shows that such soils will require a great deal of irrigation and there is the added circumstance, more important - that we believe these shallow soils to be dangerous from the standpoint of Panama Disease spread.

One or two borings southeast of the house at Garrucha were fairly satisfactory. Aside from this area, we were disappointed in the depths of the soils east of the Madre Vieja, as has been stated above. This is not saying that they should not someday be planted; a detailed examination would undoubtedly bring to light considerable areas of satisfactory character, but in general we feel that this is an area which is definitely inferior to others available at present.

Our second trip, starting from Obispo on the I. R. C. A., took us into Company property near the southeast corner of our holdings. La Gironda is a large tract of which very scanty information has been available. It seems to have had a bad reputation due, we believe, to the lack of water. This would be of importance to any one concerned with this property only, but from our standpoint means little, since we have control of the area between this farm and the Coyolate, and would bring water from the last named river. Zapote has always been considered by us a good property. Garth Volk soil mapped this farm completely, and if I recall correctly, he thought well of it.

We did not get into the center of La Gironda, but were favorably impressed by what we saw on the north and south sides of the property. Particularly on the south boundary, most of the borings were highly satisfactory. The soils of this area have good depth and impress us as first-class banana lands.

The cross-section of the Coyolate river deposits which we were able to see also left an excellent impression. Judging from this brief glimpse we are inclined to feel that the Coyolate deposits are fully as good as those of the Nagualate on which we are working at present. Indeed, we felt that they might be even better.

We did not, however, obtain the impression that there are any large areas of heavy soil in the region traversed, nor any large areas of soil types with which we are not familiar on Concepcion la Grande. We gained the impression that we have particularly on both sides of the Coyolate, and in La Gironda and Zapote, large areas of very satisfactory soils which eventually will prove highly valuable to the Company.

The future of this area - as of our West Coast development in general - depends to a large degree upon the behavior of Panama disease. This factor we consider far more important than the wind hazard.

We do not believe it is too early for definite steps to be taken looking toward the protection of these areas east of the Madre Vieja. Panama disease is spreading steadily over the coast, and in a few more years it will be impossible to obtain seed which we can with confidence assume to be free of infection. Obviously, areas planted now or in the future may become infected even if clean seed is used, but we consider that it would be an inexpensive and extremely valuable move to establish in the spring of 1941, a small seed bed east of the Madre Vieja, with a view to having clean seed for later use in the region we have been discussing.

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Tiquisate, Guatemala  
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COMPANIA AGRICOLA DE GUATEMALA

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Tiquisate, Guatemala  
December 6, 1940



Antigua, 2 January 1942

Personal

Mr Arthur M Pollan,  
Tiquisate.

Dear Arthur:

When you were here a few weeks ago we were talking about some of the principles of banana growing. It did not occur to me then to give you a copy of the enclosed paper, in which I attempted to summarise what we knew at the time it was written - 1936. Since that date we have learned more about fertilizers, and we have had to reduce plant populations because of Sigatoka. But I thought you might be interested in reading this paper anyway, though I don't think you will find in it anything which you do not know already.

We are always interested in the question, Where are we going? Before attempting to answer it, we have to stand back and ask where we come from, - at least when we are thinking of banana growing as a long-range proposition. During the past fifteen years or so, the banana has been brought out of the jungle and put on the farm - as I like to express it. It is easy to look back and see just where we have made progress. The development of the Soil Survey was, in my opinion, one of the biggest steps ever taken by the Company. Selection of the best lands, and elimination of unsuitable ones, meant lots of money saved. Then the study of drainage: the drainage requirements of different soils, and so on, was a big thing. Then another thing was the improvement in pruning which was made possible through coming to think of plant populations in a quantitative way. By standardizing the number of plants per acre for different soils and climates, more uniformity was acquired; and this is a big thing when you are dealing with thousands of acres. Then came the use of fertilizers, then better irrigation including Overhead; then finally Sigatoka control.

It is not easy to look ahead and see just what will be our major lines of progress during the next 15 years, but it is the young chaps like you who must be doing this. Obviously we will come in for further developments in cultural technique; but I am wondering if our biggest problems will not be connected with pest and disease control. It seems to be the history of most tropical agricultural

industries, that they accumulate pest problems as they grow older. This is probably because the planting of large blocks of any given species provides huge breeding grounds for any given pest, and because as time goes on, pests move about from one part of the world to another - especially in modern times, with improved means of transportation and more contact among the various parts of the tropical world. We got a good illustration of what has to be expected when Sigatoka suddenly showed up in tropical America in the early 1930's. I seem no reason to expect that this will be the last big jolt we are to face. And in a way, these things are in our favor, if we are keen enough, and energetic enough, to do a better job of controlling them than other folks can do.

Sometimes the spread of pests and diseases results in geographic shifting of an industry. Sometimes industries shift for other reasons than pests. It seems to me there has been a tendency, during the past quarter of a century, for bananas to move out of the wet tropics onto semi-arid areas with irrigation. I think this trend is highly interesting and worth watching; it is probably due to many factors, among which Panama disease has been one. That is to say, the wet lands of the Caribbean coast, on which bananas could be grown at pretty low cost, have largely been taken out of production by Panama disease.

It is going to be a fascinating job to watch the developments of the next 15 to 25 years, from the agricultural angle. There is lots of important work to be done.

Mrs Popenoe joins in best regards to the señora and yourself.

Sincerely yours,