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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.

COMPANIA AGRICOLA DE GUATEMALA

Bananera, Guatemala,
September 23, 1939

Mr. W. E. Turnbull,
LA LIMA, HONDURAS.

Dear Mr. Turnbull:

After seeing a great deal of West Coast cultivations, I believe we are making a very serious mistake in interplanting with the idea of obtaining seed.

My first and most serious objection to this method of obtaining seed is that I believe we are contributing to the spread of Panama disease. We are digging seed from areas that might have some infection and transporting it to new areas. The tremendous amount of traffic through the farms, necessary in handling seed, cannot help but aid in the spread. If we have to assume that it is inevitable that some infected seed is secured from interplanted farms, we are not only planting this infected seed but are causing further infection in the farm from which the seed is obtained by unusual traffic, stirring the soil while digging, and using implements that have come into contact with infected plants in digging seed from clean mats.

The above would be sufficient in itself to condemn interplanting for seed purposes. However, there are several other factors. We are sacrificing fruit weights and quality in maintaining the interplantings until they are required for seed because nothing can prevent the effects of excessive population.

It is quite obvious that the fruit being produced from these interplanted areas is not as good as that coming from areas handled normally. I was rather surprised to note the poor quality of some of the fruit I saw being cut last week. The condition of the mother plants that will produce next year - obviously affected by excessive shade - indicate that much more

second-class fruit can be expected from the interplanted areas. Much of the fruit I saw last week was short fingered, open-handed and certainly low in weight. To a certain extent quantitative production per acre must also be affected.

My suggestion is that we do no more interplanting. For future planting we should establish an adequate seed bed. This seed bed could easily be planted in and surrounding the area formerly used by the old Tiquisate experimental plot. It should be well cared for with the only idea of furnishing a large quantity of good healthy seed. The area should be irrigated and protected against Sigatoka. We would not be concerned with harvesting of fruit from the area. I would plant a seed bed of not less than 1,000 acres.

We have an excellent opportunity to establish this seed bed early next year in view of the fact that no planting will be done on the West Coast next year. We would have over a year's growth on this area before seed would be dug and could isolate any Panama disease cases that might show up. Some cases might not be discovered, but we would be sure we are not spreading the infection on existing cultivations in addition to new areas.

When the interplanting scheme was first developed, I was all in favor of it. I am not now. I don't believe that we are saving a cent by this method. The spread of Panama Disease, the condition of plants in interplanted areas, the quality and weight of fruit from these interplanted areas all indicate that it would be far more economical to plant a seed bed for future planting.

I have discussed this with MacKinnon and Bump and they agree. I will discuss this with you further when I see you next week.

Yours very truly,

W. L. Taillon

TELA RAILROAD COMPANY

GENERAL OFFICES, ONE FEDERAL STREET, BOSTON, MASS.

W. E. TURNBULL
GERENTE GENERAL

La Lima, Honduras,
August 3, 1940

Dr. Wilson Popenoe,
c/o United Fruit Company,
Guatemala City.

Dear Doctor:

Your letter of July 29 refers to plans of Merck & Company, and to a letter you sent Dr. Bressman of the United States Department of Agriculture on rubber investigations in Central America.

I am sure Mr. Pollan and Mr. Turnbull would want you to carry on with the Cinchona job as outlined in the third paragraph of your letter. You probably know, even better than I do, that the Company will continue to extend full cooperation to such projects. Please make your plans accordingly.

Mr. Turnbull returns here probably about August 18. We are not certain as to his plans after his arrival. I will speak to him immediately on his arrival about plans he has for you when the Cinchona job is turned over to Pennock. There is plenty for you to do, but I hope we can make the Zapote-Garrucha trip before you take on a long assignment.

You should come to Honduras by all means after you leave the Cinchona work. There are a lot of interesting experiments in progress, and it is also about time you paid us a real visit.

I am sending copies of the letters you sent Dr. Bressman and Mr. Chittenden to Mr. Pollan and Mr. Turnbull. I am also sending them copy of the first four paragraphs of your letter of July 29 to me to familiarize them with the present and proposed personnel set-up for the Cinchona project.

I am sending you a clipping which recently appeared in "La Epoca" for July 26 covering visit of five scientists to study rubber production in Honduras.

I will get in touch with you today either by radiogram or radio-phone on proposed visit of this group. I know it is the intention of our Boston office to facilitate these people as much as possible. In this connection, I sent the following radiogram to Mr. Pollan today:

Dr. W. Popenoe

- 2 -

8/3/40

"POLLAN - GOMEZ' LETTER DATED JULY 30TH ATTACHES CLIPPING FROM LA EPOCA QUOTING LETTER SENT HONDURAN GOVERNMENT BY AMERICAN LEGATION INDICATING ARRIVAL TELA AUGUST 7TH FIVE SCIENTISTS FROM U.S. DEPARTMENT OF AGRICULTURE STUDY POSSIBILITY RUBBER PRODUCTION STOP WE ARE PLANNING FACILITATE THIS GROUP WITH HOUSING ACCOMODATIONS ETC ALL EXPENSES FOR THEIR OWN ACCOUNT STOP FORWARDING YOU TODAY CORRESPONDENCE RECEIVED FROM POPENOE INDICATING \$500,000.00 AUTHORIZED BY U.S. GOVERNMENT FOR INVESTIGATION RUBBER PRODUCTION IN LATIN AMERICA STOP AM GETTING IN TOUCH WITH POPENOE TODAY IF POSSIBLE WILL HAVE HIM MEET THIS GROUP ASSIST THEM GETTING PROPER START ON INVESTIGATION STOP THIS IN VIEW HIS CORRESPONDENCE WITH DOCTOR BRESSMAN PERSONAL ASSISTANT SECRETARY WALLACE STOP COPIES THIS CORRESPONDENCE BEING FORWARDED YOU TODAY - TAILLON"

I am leaving for Tiquisate on August 4 with Mr. Heyl and may have an opportunity to see you before I return, probably Friday or Saturday of next week.

Lots of regards,

Sincerely,

W L Taillon

Enc.

Copy to: Mr. A. A. Pollan
Mr. W. E. Turnbull - New Orleans

Explotación de Hule

EL GOBIERNO de Honduras ha puesto atención a los deseos del Departamento de Agricultura del Gobierno de Washington para el estudio de la producción de hule en el Hemisferio Occidental. Es un programa general del Gobierno Norteamericano con la cooperación de varios gobiernos Istinamericanos que ya lo han aceptado de modo satisfactorio.

En la prosecución de este plan del Departamento de Agricultura de Estados Unidos el Gobierno de Honduras, por medio de la Secretaría de Relaciones Exteriores, ha concedido permiso para que expertos del referido Departamento de Agricultura lleven a cabo estudios en este país respecto a la posible producción de hule y que técnicos de parte de nuestro gobierno sean agregados como observadores a los grupos norteamericanos que hagan los referidos estudios, los cuales serán de ventaja e interés mutuos.

En este sentido, el Honorable señor Encargado de Negocios ad interim del Gobierno Americano, en nota reciente, de 22 de julio, dice, entre otras cosas, a nuestra Cancillería, lo siguiente:

«Ahora he recibido un telegrama de mi Gobierno en que se me indica que el Departamento de Agricultura es á ahora preparado para enviar un grupo de cinco técnicos sobre el cultivo del hule a Honduras; ellos son: Dr. Mark Baldwin, Doctor Theodore J. Grant, Dr. Thomas D. Mallery, Mr. Esrie M. Blair y Mr. Raymond E. Stelman. Si el Gobierno de Vuestra Excelencia lo cree oportuno es de desear que el grupo llegue a Tela más o menos el siete de agosto.»

base un memorandum para el mejor entendimiento que se elaborará por la oficina apropiada de parte del Gobierno de Vuestra Excelencia y por la Bureau of Plant Industry del Departamento de Agricultura, cuando llegue el grupo a Tela, dicho memorándum debe contener en sustancia lo siguiente: (1), que los servicios de un agrónomo de parte del Gobierno de Vuestra Excelencia sean posibles a efecto de que acompañe al grupo y asista al jefe del grupo en escoger los terrenos que deben destinarse para el cultivo de la hevea o cualquier otra planta que produzca goma; (2), que el grupo se dirija en la forma más conveniente a las áreas

Pasa a la 4ª Pág. Col. 2

Explotación

(Viene de la 1.ª pág.)

situadas al este y oeste de Tela, especialmente aquellas tierras bajas situadas cerca de la desembocadura de los ríos que vienen de las partes altas del territorio hacia el Mar Caribe, y de las áreas de la región costera de esa sección del territorio o cualesquiera otras partes del país seleccionadas en conferencias que se realicen con las autoridades del Gobierno de Vuestra Excelencia; (3) que, en caso necesario se provea al grupo de un aeroplano para trabajos de reconocimiento; (4), que al examinar las regiones mencionadas con el objeto de encontrar un asiento a propósito para los trabajos, las tierras nacionales seleccionadas por el grupo deben ponerse a la orden para llevar a cabo trabajos cooperativos de experimentación y parcelas para demostrar el cultivo de la planta de hule; (5), que para el regreso del grupo y para el mejor éxito de los informes reunidos y de los especímenes adquiridos se den las facilidades del caso en el puerto de desembarque; y (6), que al concluir los trabajos se escriba un segundo memorándum, en el cual se detalle el mejor entendimiento para continuar los experimentos y el mantenimiento de las parcelas de demostración por medio de un esfuerzo cooperativo.»

«Esta empresa no solamente tiene posibilidades prácticas pero, como lo mencioné en mi nota anterior sobre el mismo asunto representa una actividad cooperativa dentro de la naturaleza de los objetivos de la Inter-American Financial and Economic Advisory Committee y la Inter-American Development Commission.»

Si los hondureños logramos en nuestro territorio, después de los estudios consiguientes, la producción en gran escala del hule, habremos conquistado una fuente de riqueza nacional.

Mr. Bump

Tiquisate, Guatemala

October 19, 1939

AIR MAIL

Mr. A. A. Pollan
BOSTON

Dear Mr. Pollan:

I am attaching hereto copy of a letter received from Mr. Bump supporting my radiogram of October 18th covering estimated cost of seed bed near Tiquisate. A map showing the location of this area is also attached. My radiogram read as follows:

"Yours sixteenth Tiquisate seed bed STOP Total cost development gross one thousand thirtyfive acres four hundred ten thousand dollars divided as follows One sectionizing and topography eighteen hundred dollars Two drainage twenty thousand three Sigatoka installation fortyfive thousand Four railroad spur sixteen hundred five planting and interplanting including roads seed purchase and disinfection irrigation and spraying operations one year one hundred six thousand five hundred dollars Six buildings including one overseers house two foremans houses eight labor camps and one bunk camp eighteen thousand nine hundred dollars Seven overhead irrigation two hundred eleven thousand four hundred dollars Eight water supply thirtysix hundred and nine furnishings twelve hundred dollars STOP Area five hundred meters north and parallel to Tract B includes old experimental plot STOP Area to be irrigated from present Madre Vieja Canal STOP Two thousand gallon pump to be located at present Almolonga pump station eight Will irrigate three hundred thirtyfive acres Water to reach area through fourteen inch pipe and four thousand gallon pump to be located at existing Santiago pump station seven will irrigate lower seven hundred acres water conducted to area through sixteen inch pipe STOP Engineers estimate conduction water to areas by means oversize pipe cheaper than railroad and canal construction and in addition facilities at existing pump stations seven and eight can be utilized for new pump installations STOP Our idea would be to reduce traffic in this area to absolute minimum even to extent no fruit would be cut from this area For this reason we

MB
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Mr. A. A. Pollan

October 19, 1939

"selected isolated area first class soil STOP Although development cost is high we feel we are fully justified in spending this money to protect against excessive spread disease and in insuring quality and weight in fruit from present cultivations by avoiding interplanting for seed STOP We have sacrificed quality and tremendous amount fruit weight in interplanting for seed and this must be considered in determining justification for seed bed STOP Writing airmail- TAILLON."

I am also attaching copy of my memorandum of September 23rd to Mr. Turnbull, explaining why I am convinced a seed bed will prove a profitable investment.

I want to emphasize again that although the spread of Panama disease is the primary reason for our recommendation, the fact that quality and weight of our West Coast fruit are also being affected seriously by the present system of interplanting for seed, I know, will be given careful consideration by your office.

We look upon the proposed seed bed as protection against increase in spread of Panama disease. This is worth a great deal to this Division. We will improve quality and weight of fruit by ^{avoiding} interplanting, and sales price will be increased. These factors have been weighed carefully against the cost of this project, and I do not hesitate in recommending the expenditure involved.

Yours very truly

W L Tailon

Enc.

Copies: Mr. W. E. Turnbull
Mr. Hartley Rowe
Mr. H. T. Heyl

COMPANIA AGRICOLA DE GUATEMALA

Tiquisate, October 18, 1939

Mr. W. L. Tallon:

Attached is copy of estimate for proposed seedbed for Tiquisate. This will have a gross area of 1,035 acres, which, after deductions for waterways, etc., will net about 1000 acres of seedbed.

The proposed seedbed is located about 500 meters north of Tract B and extends roughly parallel to it from the old experimental plot to our upper boundary line. It is in an isolated location, which reduces danger of Panama Disease infection. Due to the shape of the area, cost of drainage and Sigatoka control installations will be high. The piping for the irrigation will also be high, but this cost will be at least partially offset by elimination of inlet canals. A further saving will be due to elimination of the railroad, which will also tend to eliminate traffic through the seedbed.

Preliminary design indicates that the most economical irrigation layout will be made by placing an additional 2000 GPM plant in Plant No. 8 in Almolonga, and an additional 4000 GPM plant in Plant No. 7, both of which take water directly from the Madre Vieja canal. These will irrigate 325 acres and 700 acres respectively. Saving in construction will be made by using extant intake wells, oil tanks and auxiliary equipment. A saving in operation is obvious. The water will be conducted from the pumping plants to the farm in large size pipe -- probably 14" and 16".- although we will investigate even larger sizes. Only preliminary figures are now available for the system, and we are making the final design as rapidly as possible. We believe, however, that we will be able to make the construction for the amount estimated although, of course, there is always a chance for final design to modify our estimate.

Planting distance is to be 5 meters by 5 meters. The seedbed is also to be interplanted, which will give a total of 324 mats per acre. After the plot has served its period of usefulness as a seedbed, it can be converted into a standard banana farm by constructing a few additional buildings, replanting and bringing into bearing. Roads would be constructed at the present time which would serve for delivery of seed, and later of fruit.

It is proposed to purchase seed from disease free farms on the West Coast. We will insure this by taking a mat survey of cultivations from which seed is to be purchased. Seed is to be disinfected before being loaded into railroad cars. Rigid inspection of seed purchases will be enforced. The soil is first-class and all but two hundred acres of it are equal to our finest. Two hundred acres contains some clay, which indicates the need for additional drainage.

Mr. W. L. Tallon - 2

October 18, 1939

The most obvious benefit of a seedbed and the main reason for its construction, is in making provisions for a supply of good disease free seed for future planting. The importance of this feature alone cannot be exaggerated, and due to the scattering of Panama infection throughout all of our 1937 and 1938 farms, with the possible exception of Solola and San Marcos, it seems obvious that we can no longer hope to get entirely disease free seed from our farms. A strong secondary benefit is the elimination of seedbeds within our farms which will allow us to start pruning for fruit immediately and eliminate a certain delay in getting our cultivations into the best possible fruit-producing condition, and will also eliminate unnecessary work and traffic through farms where Panama disease infection is thought to exist.

A. L. Bump
A. L. Bump

Enc.

SEEDBED - 1035 ACRES

1.	Sectionizing and Topography	\$ 1,800.00
2.	Drainage 250,000 cu. meters at \$.08	20,000.00
3.	Sigatoka Installation \$45.00 per acre	45,000.00
4.	Railroad spur	1,600.00
5.	Planting 5 meters x 5 meters interplanted Seed to be purchased and disinfected	106,500.00
	Engineering at \$1.00 per acre	\$ 1,000
	Underbrushing at \$1.85 per acre	1,850
	Lining at \$3.00 per acre	3,000
	Felling at \$3.00 per acre	3,000
	Planting at \$3.00 per acre	3,000
	Purchase cost of seed, including disinfecting 235,000 heads at \$.11, or \$25.85 per acre	25,850
	I.R.C.A. railroad freight on 155 cars seed at \$40.00	6,200
	Hauling seed from Company railroad to farm	1,000
	Cleaning Drains	1,000
	Roads	15,000
	Bridges	5,000
	Cleaning - three at \$.90	2,700
	Pruning - three at \$.40	1,200
	circoling - 2 at \$.80	1,600
	Supplying 5% - 16,000 supplies at \$.02	300
	Superintendency	3,500
	Miscellaneous - Manaca shacks, water supply, mule feed, labor charges	1,800
	Irrigation - application	17,500
	Fertilizing	2,000
	Sigatoka control	10,000
		<hr/>
6.	Buildings	18,900.00
	As seedbed will eventually be a farm we should construct any buildings necessary on a permanent basis, not using manaca shacks anymore than necessary. When seedbed is later converted into a farm, more buildings will be required.	
	Overseer's House	3,800
	Chicken house	100
	Stable and bodega	400
	2 Foreman's houses	1,000
	8 Labor camps	12,800
	1 Bunk camp	800
		<hr/>

SEEDBED - 1035 ACRES

7. Overhead Irrigation \$ 211,200.00

Seedbed to be supplied by a 2000 GPM pump at Almolonga (Pump No. 8) and 335 acres irrigated through a 14" or larger pipe from that point. The lower project, of about 700 acres, is to be irrigated by a 4000 GPM unit at our existing Station No. 7 and the water conducted to the farm through a 16" or larger pipe.

These systems are cheaper than the installation of one unit within the farm with necessary canals and railroads.

8. Water Supply 3,600.00

Pump	\$ 400
Well	1,000
Tank	1,200
Pipe lines	<u>1,000</u>

9. Furnishings
Overseer's House

1,200.00

Total

\$ 410,000.00

Tiquisate, Guatemala
October 18, 1939

COPY

Boston, October 27, 1939

Mr. W. L. Taillon
Assistant General Manager
Tela Railroad Company
La Lima, Honduras

Dear Mr. Taillon:

I refer to your radiogram of October 18th and your letter of October 19th, both regarding cost of seed bed near Tiquisate.

Our radiogram of October 16th was sent and your radiogram and letter of reference were received during Mr. Turnbull's stay in Boston. As agreed with Mr. Turnbull, nothing will be done at the present time in the matter of providing additional seed bed. It has been decided to defer any action until about March of 1940, by which time we should be in a good position to know whether any planting is to be done during the coming year. If no planting is to be done, then the existing interplanting put in during 1939 will be used as far as necessary in the establishment of seed beds for future planting and the remaining interplanting cut out.

Yours very truly,

(sgd) A. A. Pollan

cc Mr. H. Rowe
Mr. W. E. Turnbull
Mr. H. T. Heyl

OFFICE OF THE GENERAL MANAGER

La Lima, Honduras

November 28, 1939

Dr. Wilson Popenoe
Guatemala City

Dear Doctor:

You have received copies of the most recent correspondence covering Panama disease. I refer to Dr. Dunlap's report addressed to me, copy of which Boston forwarded to you.

Dr. Dunlap advises me that you recommended following out his suggested treatment for our Tiquisate cultivations. I did likewise in a letter to Mr. Pollan covering Dr. Dunlap's report.

In this connection I know you will be interested in attached copies of letters exchanged with Boston covering proposed seed bed for Tiquisate.

Yours very truly

W L Faillon

La Lima, Honduras
December 7, 1939

Mr. A. A. Pollan
United Fruit Company
Boston, Mass.

Dear Mr. Pollan:

Regarding Venezuela.

General Félix Galavís, a friend of Mr. Hatch, whom I met in Venezuela some time ago, sent Sr. Félix Antonio García to Honduras with a letter of introduction to me, advising that García would be connected with Galavís in the banana business and was anxious to learn as much as possible of Central American methods, particularly for controlling Sigatoka, etc.

García had already visited the Colombian division and absorbed a lot of information. He is intelligent and energetic and very observing. He has been now for several days here, and Mr. Taillon has had our people show him around in connection with all operations. We are giving García a certain amount of data and information which he has requested regarding pumps, pipe systems, costs, etc. The information being given is something which without any trouble he could obtain elsewhere, like from Barrios Ferrer in Colombia, or from the Mexican or Colombian Governments, etc.

Galavís asked García to consider taking a considerable number of Honduran laborers to Venezuela, to work as "colonos" in Galavís' property. García realizes that it is impossible for many reasons and inadvisable to attempt doing such a thing. He may take one or two farm foremen later on, to show the Venezuelans how to cultivate bananas.

It is very difficult to believe what General Galavís or his representatives have to tell one in connection with banana industry. However, García's story is as follows:

Galavís has about 250 hectares of bananas in production -- he makes shipments from Puerto Cabello to New York on the Grace Line. He wants to extend his present cultivations up to 1,000 hectares. The Venezuelan Banana Company which is sponsored by the Venezuelan Government is also ready to start a considerable amount of planting -- it is not clear whether Galavís' planting and the Venezuelan Company's planting are the same or different. Supposedly, the Venezuelan Government has already put up 750,000 bolivers as part of three million bolivers with which the Government, as a stockholder, will help the Venezuelan banana company.

I think that Galavís is anxious to extend the development of bananas in Venezuela, particularly if he can do so with someone else's money. I believe that he wants to obtain first class information as to proper methods to use, with the idea of carrying them out, and for that reason has sent García.

I offered to have General Galavís visit Honduras as a guest of the Company from the time I met him in Venezuela, but he has been too busy to come personally.

Mr. A. A. Pollan, Boston -2-

Lima, Dec. 7, 1939

It might be that Galavis wants to impress our Company, or perhaps worry us or frighten us a little, by letting us know of extensive plans which they have in mind for the early future.

Furthermore, I believe that more bananas are going to be planted in Venezuela, and soon. I don't doubt that the Government has put up money, and I believe that they will continue to do so until they wake up and find out that their venture is unprofitable. I would not be surprised if in the meantime, with Government assistance, they raised some bananas and applied Sigatoka control to same. I would be surprised if they picked the right kind of land for their cultivations. This because Galavis' ideas are more towards planting bananas on his own property than on planting on carefully selected land. I think that we should have someone visit Venezuela early next year. Dr. Popence, if he can be spared, would be ideal for a short trip and a thorough report. Quijano, who as far as I know will be available, could also make a short trip or go there and stay quite a while if anybody's activities there warranted more investigation. I am writing you about Quijano in a separate letter. If neither one of these two are available, Hamer could send someone from Colombia.

Yours very truly

W. E. Turnbull

cc Dr. Wilson Popence
Mr. R. H. Hamer

Antigua, Guatemala, 8 January 1940

Personal

Mr W E Turnbull,
Montgomery and Co.,
Mexico City.

Dear Mr. Turnbull:

After having talked with Bill Taillon over the radiotelephone, we are hopping off for San José de Costa Rica on the 11th. I asked Bill whether he thought I ought to hurry right down there, or whether I would have time to stop first at La Lima for a week; and he felt as I do that the best thing is to hurry right down to Costa Rica, since you asked me to get there ahead of the jefes. I am hoping to see you down there. In case I do not, there are one or two things I had best mention to put you al tanto.

I have gone into the agricultural school problem pretty fully. Doctor Johnston and I called upon the Ministro de Instrucción Publica two days ago. I told the Ministro you asked me to pay your respects and assure him of the Company's continued interest in the welfare of the school, and our desire to cooperate with the government in this connection, in any manner the government thought convenient. The Minister was very appreciative and talked at length about plans for the school. He made two or three good points: one, that the President feels that this school in past years (before it was moved to Chimaltenango) had too much classroom work and not enough *práctica*, for which reason he does not want too many buildings at Chimaltenango; and second, he wants the boys themselves to do as much of the construction work as possible, so as to get experience. I felt

as usual that the President is mighty sound and far-sighted in his outlook.

After getting your letter about budgeting the model dairy, I went over the ground again with Dr. Johnston and my feeling is that we may well be considering this move, but that we should wait another year before broaching the matter definitely. I do not believe the school is quite yet prepared with potreros and other facilities to make full and proper use of a model dairy. If those fancy cows dont get their bellies full of pretty good zacate they wont give much milk and the model dairy will give a black eye. Dr. Johnston is preparing a presupuesto which he promised to let me have tomorrow. I suggest we hold this for the time being. You may want to get Mr. Pollan's approval, after which we can sit tight until the right moment seems to have arrived.

I went over Tiquisate with Mr. Hoyl, Bill Taillon and Mackinnon. It was a pleasure to see what progress has been made down there. I also called on Manuel Herrera and found that he hasnt any definite plans for shipping papayas to the States; and that he says he can use all he grows on his present planting at the Palace Hotel. I told him our experience with the papaya business in Florida and he agreed if we could not make any money at short range like that, there wasnt much hope of doing better at long range. I dont believe he will get in deeply enough to hurt himself. It is always a pleasure to talk with Don Manuel; he is so open minded.

I sent Mr. Perkins your letter, which I know he will be glad to get as he wrote me he was anxious to know what to

count on. I have sent you a copy of mine to him, saying that his work will of course have to be fitted in to our own. As I see it now, I think the following program may be feasible: Costa Rica now, then Venezuela for a month or so, and back here about May to take up the Perkins job. I just put this down as a basis for further consideration. I noted from Mr Pollan's letter (copy to me) that they want me to go back to Venezuela early this year. I shall be glad to do so, though I always hate to pay those sharks twelve dollars a day for that bum grub and the musty rooms at the Palace.

We have greatly enjoyed our stay in Guatemala, and I want to thank you again for making it possible. Last night Walter Hamer came over from town and took dinner with us; I had previously seen quite a bit of him at Tiquisate and I think he is going to be a grand addition to the Company staff. He strikes me as being another Reggie, and you know what I think of Reggie.

Helen and I have been envying you and Conchita the opportunity to see that country around Puebla. One of these days you've got to send me back to Tuxpan or somewhere, so I can get a chance to look at it again. We hope you have both enjoyed your stay up there -as I am sure has been the case - and we look forward to seeing you again.

Sincerely yours

Copy to La Lima in case this does not catch you at Mexico City

W.E. Turdbull
c/o RC Communications
Ciudad Trujillo - R.D.

May 27, 1940.

Dr. Wilson Popenoe,
United Fruit Company
Guatemala, Gua.

Dear Doctor Popenoe:-

Rather late in the game I will thank you for your letter of April 6 from Caracas, your summary of the Banana situation in Venezuela as of April last, copy of your letter of April 5th. to General Galavis, and your note to me of April 2nd. re. our friend Ralph. I enjoyed reading your letters very much - the news of the banana business there is to me welcome. I am sorry about Ralph and when I think it will do any good and I know how I will help him.

I will be glad to hear from you after you have had a chance to see things in Guatemala. I know that at present you are with the Merck people and hope that you find that work interesting.

My office writes me that it seems that the Govt. in that country (Gua.) is showing considerably more interest in the Chimaltenango school - I hope something decent is the outcome.

We have partly acquired a considerable amount of land here - I say partly because until the perfected titles are laid in my lap I wont feel that we really own anything. How much of what we have got is good we dont know but should soon as Don Lungwitz is here doing preliminary work for Dr. Dunlap who will come here later. I like the country, the people and the prospects. I may get back to C.A. say in July if only for a spell.

Dr. Rosen, head of the Jewish Refugee movement is here and sends you his regards.

The Standard's bananas in Haiti look pretty putrid. According to Wardlaw they are suffering from Plant Failure. That is the nicest and most convenient term I have heard used in some time. Other things besides bananas in Haiti are suffering from "Failure" of some sort.

My kindest regards to Mrs. Popenoe and the same
to you. Sincerely,
W. E. Turdbull

Antigua, Guatemala, 12 June 1940

Mr W E Turnbull,
a/c RCA Communications,
Ciudad Trujillo, R.D.

Dear Mr. Turnbull:

Your letter of May 27th was most welcome. It is a long time since I have had a chance to sit down for a good talk with you. I hope we shall have an opportunity when you come over here in July.

This Cinchona business is keeping me as busy as a one-armed paper-hanger, and I am enjoying it. The U S government is much interested in the project, as is the Guatemalan government. I am seizing the opportunity to make it clear to both that the United Fruit Company, though having no financial interest whatever in the work, is glad to cooperate because it is convinced the project is of distinct interest to Guatemala and to the U S. Frankly, if the work turns out as I believe it can, there is a good possibility of its meaning a million dollar industry to Guatemala. Merck and Company annually use this much quinine, which they now purchase from Java and which they want to get here. In addition to what Merck uses, there is the possibility of supplying the entire U S market which is another million dollars annually. President Ubico, I understand, is keenly interested in the project and I feel sure he will appreciate our doing all we can to further it.

When Mr Pollan came here, Bill Taillon very kindly invited me to accompany the party on the magnificent and luxurious new 150 to the West Coast. We spent two days at Tiquisate and I must say I was delighted with the situation on the farms. I

to the Mr Pollan and never before, have I ridden all over the farms

of a Division without seeing one single spot which I could point to and ask, "What's the matter over there?" Poor old Mackinnon has been running back and forth to the hospital for the past several weeks with an attack of dysentery, and when we saw him did not look at all well. I am trying to get him up here to Antigua for a few days to cool off; and to get away from the radio, where he hears too much war news, of the wrong sort.

About the agricultural school: I spent yesterday with Dr Johnston, calling on the Ministro de Instruccion P^ublica and the folks at the Ministerio de Agricultura. The Doctor has recently had funds to build three new classrooms and a servicio sanitario and feels that things are going very satisfactorily. He would like to know what you think about the Model Dairy. If you are ready to go ahead, he is. Probably you had best leave this until you come here in the near future: then, if you think well of the plan, I suggest you authorize Mr Heyl to pay the bills and let the Doctor start the construction.

After I left Venezuela I spent three days in Trinidad which were extremely interesting and profitable. I talked with Wardlaw at length. He told me all about "Plant Failure" in Haiti. As you say, this is a very convenient way of saying things aren't all they ought to be. As I wrote you previously, Wardlaw was loud in his praises of the work you have done in Honduras. I was in Jamaica when he paid his second visit to that Island, and took part in the conference he had with all banana interests at the end. I was not much impressed by what he had to say about our Jamaican problems. Particularly on Sigatoka, where he was weak. On Panama disease he helped by recommending that the government reduce the severity of quarantine measures.

About Venezuela: I have just had a letter from Bert Muller, pathologist of the Ministerio de Agricultura y Cria, who says nothing further seems to have been done about "Moko" disease since I was there, but that he has recently been asked by the Minister to recommend the best types of portable sprayers for control of Sigatoka, and in line with our conversations has put in for Hardies like we use in Jamaica.

I feel that our own situation in Venezuela is just about what it should be at this juncture. I believe we have convinced the Venezuelans as well as the American Ambassador that we are not trying to obstacularizar, and that our advice so far has been honest and sound.

Naturally I have been greatly interested in learning of developments in R.D., and I hope everything works out as you desire. If Dr Rosen is still there please give him my regards. I took a great liking to him when I met him here in Guatemala, and I am very glad he didnt dump a batch of those refugees on the Zacapa plain.

Warmest regards, in which Mrs Popenoe joins.

Sincerely yours

TELA RAILROAD COMPANY
Office of the General Manager

La Lima, Honduras

October 15, 1940


Mr. A. A. Pollan
Boston, Mass.

Dear Mr. Pollan:

Regarding Panama Disease in the Honduras Divisions:

As you know, Dr. Popence had been absent from Honduras quite a long time. When he came here I asked him to make a careful, general inspection of our farms, but particularly to note the amount of Panama disease. Attached is copy of letter to me dated October 13, which I consider very encouraging. A report made by someone who knows Panama disease as well as Dr. Popence and who has not seen our farms for quite a long time is, I think, as valuable as anyone else's, if not more so.

Yours very truly



W. E. Turnbull

cc Dr. Wilson Popence

Antigua, Guatemala, 15 November 1940

Mr. W.E. Turnbull:

The following interesting report on the banana situation in Venezuela has just reached me in a letter from Albert S. Muller of Caracas, dated 9th November. As you know, Dr Muller is the Fitopatólogo of the Ministerio de Agricultura y Cria, and has at several times in the past visited the Yaracuy valley in connection with banana diseases in that area. I quote:

"In both your letters received last month you inquired about the banana disease situation in the Yaracuy. Finally I have made a trip there in brief form in view of an order to inspect the "Bananera" (Compañía Bananera Venezolana). Without contact with General Galavis or his men who were not to be found, I covered also Bella Vista and Urama, but I can't say anything about other plantations in the region. I want to go again.

"The "Bananera" has now 350 hectares with a slight touch of Sigatoka in the lower leaves. The Sigatoka is very severe in Urama and Bella Vista. At the "Bananera" the Moko is not apparent and Monfils, the agrónomo, all year long has eliminated all suspicious cases that appeared. In Urama plátanos are being put in where there were bananas and the cause is Moko. There are some widely separated banana plants still standing, badly burned with Sigatoka. About half of Bella Vista along the stream is 100% destroyed by Moko and the dead plants still stand among the tall weeds. The percentage of apparently diseased plants decreases as you go away from the stream towards higher drier land. I have never been asked by the General to come out since you left. The recommendation I made about purchasing Hardie Sprayers in April, to the Ministry, was rejected and no one has one yet. Thomas Fennell of Haiti visited the Bananera and Bella Vista three weeks ago. No doubt he has written you. The General is not shipping to New York and he and Reyna are there."

You will recall that Urama and Bella Vista, mentioned above, are two of the Galavis plantings, while the Cia. Bananera Venezolana is the Company in which the General is the silent partner but the moving spirit.

Wilson Popenoe

cc Mr A A Pollan

La Lima, Honduras

January 6, 1941

Dr. Wilson Popenoe
% United Fruit Company
Guatemala City

Dear Dr. Popenoe:

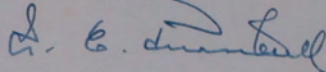
This will confirm my radiogram of January 4 to you as follows:

"You will definitely go to Cuba during this month remaining there probably until late March after which you will go Colombia STOP Glad to hear about Muller's acceptance."

I take it that you will hear direct from the U.S.A. Department of Agriculture as to when and where you should report. Unless you receive instructions to the contrary, I would like it if on termination of your work in Cuba you proceed to Colombia to help out Mr. Reggie Hamer.

I will probably have a chance to see you in Guatemala City before I leave for Santo Domingo on January 22.

Yours very truly



W. E. Turnbull

cc Mr. R. H. Hamer

COMPANIA AGRICOLA DE GUATEMALA

La Lima, Honduras

January 6, 1941

Dr. Wilson Popenoe
% Mr. M. V. Molanphy
United Fruit Company
Guatemala City

Dear Dr. Popenoe:

This will acknowledge receipt of your letter to me of December 27 enclosing a brief report made by Mr. Hutchings and yourself on lands east of the Madre Vieja, Guatemala west coast. I find your report interesting and somewhat encouraging:

AS regards the seedbed for future planting and the possibility of locating it at some place like Concepción, east of the Madre Vieja: I attach copy of letter which I wrote to Mr. Pollan on January 2 in connection with seedbed for future planting on the west coast of Guatemala. You will note that for the present we have not planned on putting in a seedbed. I feel, however, that before long Mr. Pollan will authorize us to do so, and no doubt your letter and report above referred to, will help to influence him along these lines.

In the second paragraph of your letter you state that you think it is still possible to get clean seed in the area above Coatepeque. I don't know if you refer to cultivations there entirely free from Sigatoka or if you have overlooked the fact that we most strongly recommend against seed from plants affected by Sigatoka.

I am sending Mr. Heyl a copy of your letter and report above referred to.

Yours very truly
W. E. Turnbull
W. E. Turnbull

COPY

COMPANIA AGRICOLA DE GUATEMALA

La Lima, Honduras

January 2, 1941

Mr. A. A. Pollan
Boston, Mass.

Dear Mr. Pollan:

Regarding seedbed in Tiquisate to protect future planting on the west coast of Guatemala:

I mentioned this matter to you in New Orleans last month, at which time you explained to me that for the present it was not a good idea to put a seedbed on account of uncertainty in future planting programs -- the limitation of expenses, etc. I quite agreed with everything you said, and am writing this letter more as a matter of record and to advise Mr. Heyl and his organization of what we talked about.

As you know, there is a certain amount of Panama disease in every one of our farms on the west coast. In fact, it might be safe to say that a little Panama can be found almost in every section in all of the Tiquisate farms. When we want seed for future planting we will probably have to dig it from our own present farms. It is no longer a question of buying seed or cultivations from independent planters whose properties are 100% immune from Panama, because unless these properties have been rehabilitated they will be lousy with Sigatoka, and we certainly should never use seed from Sigatoka-infected areas -- recent experiments along these lines have taught us something of value.

As soon as conditions permit, I hope you will allow us to put in a seedbed somewhere around Tiquisate which would be made from seed from the cleanest parts of our farms or from some rehabilitated area, and it

Mr. A. A. Pollan

-2-

Lima, Jan. 2, 1941

should be put in and spaced just as a regular farm so as to permit a 100% control against Sigatoka -- we have made the mistake of allowing seedbed, like at Palmar, Costa Rica, to get so thick that combating Sigatoka became almost impossible. We will not do the same when we put our seedbeds in Guatemala.

Yours very truly

W. E. Turnbull

cc Mr. H. T. Heyl
Mr. A. L. Bump

Antigua, Guatemala, 13 January 1941

Mr W E Turnbull,
La Lima.

Dear Mr. Turnbull:

Yours of January 6th, regarding my program for the immediate future, has been received. I have also had word from Washington, to the effect that the agricultural survey of Cuba will commence about the 20th of this month. Since I have everything cleaned up here, I am taking the Talamanca to Habana tomorrow, which will put me in Habana on the 16th. I will probably have a few days before the other members of the party arrive. This will give me a chance to get in touch with friends at the Experiment Station and pick up a little advance information generally.

In accordance with your instructions, I will proceed to Santa Marta and report to Reggie Hamer when the Cuban job is finished, unless you advise to the contrary in the meantime. You can reach me in Habana, by mail, care of Oscar Lanier, at our uptown office - Prado 65. I will also keep in touch with Isidoro Gonzales; and I will drop you a line from time to time to tell you how things are coming on.

Thanks for copies of correspondence re the agricultural school. I believe the time has now come for us to put this school on its feet. It has been, and still is, my ambition to see it so well run and so popular that boys from Honduras and Salvador will want to come here. Naturally it will take time, but I do not think it is so much a matter of funds as of organizing and directing the efforts of the students themselves. After all, with 80 husky boys on the job, boys whose training is intended to be along practical

lines, a lot of work can be done in the field without paying for any labor. With your approval, I intend to work closely with Muller on this project, helping him get seeds and other planting material. so that attractive orchards and demonstration plantings can be developed in a few years' time. This really wont cost anything; it just means work.

Thanks also for copy of your letter to Mr Pollan about the rubber agreement with the USDA. I hope Boston will approve the arrangement for it means a great deal to the future of this work, and assures our getting our proper share of the total rubber development, here in Central America. Mr Manifold told me, confidentially, that he believes there are 100,000 acres of good rubber land on the Guatemala West Coast, land in the lower edge of the coffee zone, that is, between 1000 and 3000 feet in elevation. Yesterday in talking with B.B. Lewis I mentioned this to him, and mentioned also that the folks from Washington expect to get close to 1000 lbs of dry rubber per acre per year from the superior strains they are bringing here from the East. B.B. pulled out his pencil and did a little figuring, and was surprised to see what this might mean to the I.R.C.A. in terms of freight. I still hope and believe it will be possible to carry out experiments in Guatemala which will serve to demonstrate the possibilities here. In fact, a start has already been made and I think local people who are interested will see that the work is carried forward.

Mr. Perkins of Merck and Co. has been here this past week - in fact I believe that he plans to remain in the country until about the 25th - and I ran down to Naranjo with him for a day, to go over the work done during the past summer. He seems to be satisfied with the progress made.

About the possibility of developing Panama disease-free seed somewhere on our West Coast properties: It has been my impression that there are still a few farms above Coatepeque and in the Tumbador zone which have not yet been affected by Sigatoka to such an extent that the seed will not do for the purpose we have in mind. And in some of those farms no Panama disease has been observed as yet. Any planting we would make would of course stand a chance of becoming infected. We all realize, I think, that Panama disease is a pretty hard thing to dodge. But it seems to me that a small seedbed in an isolated spot, made with seed which we believe is still clean, would be a good gamble.

Best regards to all of you.

Sincerely,

Wilson Popenoe

Research Department
La Lima, Honduras
October 28, 1941.

Dr. Wilson Popenoe:

In order to interpret clearly the analyses of soils in relation to their plant nutrients, it is necessary to understand the form in which these nutrients are present in the soil and also the factors which influence their availability. Therefore, before entering upon a discussion of the report submitted of the Guatemala soils, I would like to discuss briefly the plant nutrients and their relationship to each other in the soil.

Hydrogen Ion Concentration or pH.

The pH of the soil is of primary importance in plant growth. Each variety of plants has its own pH or acid range, and thrives and grows best within this range. This does not necessarily mean that they will not grow outside of the range, but, for maximum growth, the pH of the soil must be corrected to suit each individual plant. Some plants are favored by a considerable degree of acidity and may be grown successfully at a reaction as low as 4.6 pH, if other factors are properly adjusted, this degree of acidity being essential to prevent disease. Other plants thrive best in soils only slightly acid, neutral or slightly alkaline, and will not become productive outside of this range.

Very few plants are known to grow below an acidity of 4.0 pH or above alkalinity 9.0pH. The degree of soil acidity or alkalinity influences the salts in the soil solution, their combination in the soil, and also their availability to plant growth. An example is the precipitating of iron out of the soil solution at a pH of 7.0 unless all other nutrients are properly balanced in the soil. Acid soils can be corrected in most instances by liming, and, alkaline soils by the addition of acid fertilizers with high sulphate content.

Nitrogen and Ammonia.

Nitrogen exists in the soil, largely in the form of partially decomposed organic residue containing proteins. Micro-organisms (bacteria and fungi) gradually transform this nitrogen into ammonium compounds. Thus organic nitrogenous fertilizer materials and leguminous crop residues are more readily attacked, due to their high protein content. Some fertilizer materials,

such as sulphate of ammonia and ammonium phosphates, add ammonium compounds directly to the soil, while others are extremely toxic and have a burning effect upon the foliage.

Nitrogen in the form of ammonium compounds may be utilized as such by many plants, especially during their early growth period. Under normal field conditions this form of nitrogen is rapidly converted, first into nitrites, and then into nitrates, by certain species of bacteria. Hence soils rarely show high ammonia tests, unless they have been fertilized with nitrogen in this form during the past few weeks. At other periods a high ammonia test is an indication of poor nitrification potentialities in the soil, as consequence of high acidity, of poor soil aeration due to water-logging (poor drainage), or some other abnormal factor.

Nitrate nitrogen, whether formed in the soil from nitrification of ammonia derived from organic residues and fertilizer materials, or directly supplied in the fertilizer, is rapidly assimilated by the roots of living plants and is readily lost from the soil by the percolating action of heavy rains. Where the soil is very sandy or the rainfall very heavy, it is best to include both organic and inorganic carriers of nitrogen.

As nitrogen is readily leached from the soil, application should be made frequent or at those periods in which the nitrogen is most readily drawn upon by the plant. Perennial root systems take up nitrogen through a much longer period of the year, and low nitrate tests do not necessarily indicate a lack of available nitrogen. Therefore, with crops of perennial root systems, it is best to add nitrogen in a form that becomes available over a period of time. Sodium nitrates become immediately available, while Urea and Calcium Cyanamide is much slower.

Phosphorous

Phosphorous occurs in unfertilized soils in slowly soluble mineral and organic combinations. It is a component of all mixed fertilizers and is most frequently applied alone as super phosphate. Phosphates are never leached downwards and under normal conditions are always in the available form. In soils of only moderate degrees of acidity, applied phosphates remain for long periods in this form. On highly acid soils, containing much active aluminium and iron, phosphate may be bound up with the elements in insoluble forms. The Magnesium-phosphate ratio is very important for plant growth, the magnesium combines with the phosphates to form magnesium phosphate, in which form it is most readily utilized by the plant. On the other hand, with an abundance of available phosphates, the iron may be made unavailable by precipitating the iron as iron phosphates.

Very marked effects are noted from the use of super phosphate on strongly acid soils. In most cases where the soil nutrients are balanced, phosphates precipitate the iron and aluminium, the latter of which is often present in toxic concentration in acid soils. Phosphates also taken up by the plant may have a

function of offsetting any toxic effect of the aluminium within the plant rather than causing its precipitation in the soil and prevents its absorption by the plant.

The advantage in using super phosphate as a form of phosphorous, is that the root hairs come directly in contact with the particles and absorb the phosphoric acid before it can be bound up by a high aluminium content of the soil. There is no reason why heavy applications of super phosphates should be added to sandy soils as root systems are generally sufficient.

Potassium

Potassium occurs in soils in large amounts in the form of different soluble rock minerals. Their gradual decomposition liberates small quantities of potassium which are loosely combined with colloidal material (clay and humus) capable of being displaced into the soil solution by base exchange reactions. The active potassium of the soil, best capable of nourishing the crop, is that which exists in exchangeable form, or in true solutions. As some potassium is removed from the soil by leaching, especially when under cultivation, active potassium may be removed from the soil more rapidly than it may be replenished by natural processes.

Potash should be applied annually, especially with rapid growing crops. Muriate of potash is more valuable than sulphate of potash, especially in regions of heavy rainfall and considerable run-off.

Calcium

Calcium in soils occurs in the form of undecomposed carbonates (in calcareous soils), rock minerals, as exchangeable calcium (absorbed by the soil colloids) and as soluble calcium salts. Acid soils contain no carbonates and are depleted in exchangeable calcium. However, many soils which show a considerable degree of acidity may have a fair amount of exchangeable calcium. This is especially true of soils high in organic matter or active mineral colloids. Soils with high and very high calcium tests contain adequate amounts of calcium for all crops. Usually they do not respond to liming, unless a high active aluminium concentration is indicated. On the other hand, a lack of sufficient manganese and boron is most likely to be associated with calcareous or heavily limed soils. In soils high in magnesium, calcium is readily thrown out of solution regardless of the soil acidity.

A low calcium test on soils, with a high aluminium test is a certain indication of lime requirements for all except the most acid-tolerant plants. When a very low test results, lime should be used in liberal amounts, a heavy liming brings about an abnormal soil balance, especially in sandy soils, throwing the available potash out of solution.

In most cases the calcium test is a better indication of lime needs than is the pH test.

Magnesium

Magnesium occurs in soils in the following forms: Dolomitic carbonates; unweathered minerals; unchangeable magnesium, absorbed by the soil colloids, and soluble magnesium salts.

High and very high tests for magnesium are developed from calcareous soils derived from dolomitic limestones, and from moderately acid soils. Medium tests are more common on soils of moderate acidity, or calcareous soils from high calcic limestones. Low tests are common on acid soils. Some strongly acid soils give very low or negative tests. This is particularly true of sandy soils. In such cases magnesium should be added. On soils giving high calcium and very low magnesium tests of pH values as high as desired for the crop, magnesium sulphate (Epsom Salts) is to be preferred.

Aluminium

Aluminium occurs in large amounts in all soils in the form of undecomposed minerals and in the inorganic colloidal material. In neutral, slightly acid or slightly alkaline soils, the element is in inert combinations that have no direct effect upon plant growth. At greater degrees of acidity, aluminium becomes active; capable of combining as soluble salts and thus exerting a toxic effect upon the growth of many plants, especially those which are benefited by liming when grown on acid soils. A high or very high test is a certain index of an undesirable acid soil, upon which acid sensitive crops are almost certain to fail. A low or negative test is desirable except for distinctly acid tolerant plants.

Manganese

Manganese occurs in small amounts in all soils, chiefly in relatively insoluble combinations. In some calcareous soils and acid soils that have been heavily limed, practically no manganese is present in active forms. On the other hand, strongly acid soils may contain injurious concentrations of active manganese compounds. Under such conditions liming is a corrective measure. Manganese is changed by oxidation to less active forms, or may be leached from the soil. A negative test indicates the desirability of applying manganese. Twenty-five pounds of commercial manganese sulphate per acre are usually adequate to correct any possible deficiency. It is doubtful if any manganese is necessary if a positive test is obtained.

Iron

Iron is an abundant constituent of all soils, existing in the form of iron oxides and many complex mineral combinations. Normally only very small amounts of iron are in active form in the ferric state of oxidation. Under conditions of high acidity, larger amounts are to be found, and under poor drainage conditions, especially in the presence of organic matter, active ferrous iron compounds are developed. Soluble ferrous salts are harmful to plant growth and contribute to the infertility of poorly aerated soils.

There is generally sufficient iron in all soils to meet the plants need, unless the soil becomes too alkaline; in such cases iron is precipitated and

a chlorotic condition results.

Boron, Copper and Zinc.

These elements are essential in only minute quantities. The application under normal conditions is not necessary, but in soils of high acidity they have been found to be absent. In this case addition is necessary.

The cultivation of Cinchona being chiefly confined to South America, Java and India, a great deal of experimenting is necessary in order to determine its growth habits and nutrient requirements in Central America.

Knowing that Cinchona will thrive at an altitude of between 2000 and 5000 feet, we can arrive at some conclusions as to the growth requirements in Central America. Assuming that Cinchona thrives well on an average soil and grows at an average altitude of 3500 feet, the pH of most soils at such a range would be between 5.0 and 6.5 pH. Therefore, assuming these two growth factors are correct, a discussion of the soils under question can be made.

As the report submitted by the New Jersey State College, of their Rapid Soil Tests of these soils, is given in symbol form, it is first necessary to convert the nutrients present to some factor which can be compared with the average soils in Guatemala and Honduras.

Using the standard nutrient table, the conversion of the Guatsmala soils is as follows:

<u>Location Chimborazo</u>						
pH	<u>One foot.</u>			<u>Three feet.</u>		
		5.70		6.00		
	<u>Symbol.</u>	<u>P.P.M.</u>	<u>lbs. per acre</u>	<u>Symbol</u>	<u>P.P.M.</u>	<u>lbs. per acre</u>
No ₃ -N	H-	12	60	L-	2.5	10
NH ₄ -N	VVL-	10	1	T	---	---
P ⁴	T	---	---	L	0.25	25
K	L-	15	150	VL	7.5	75
Ca	EH	500	5000	H-	300	3000
Mg	T	---	---	VVL	2	10
Al	H	5	250	H	5	250
Fe (Ferric)	VL	0.5	5	L	2	15

Lojf

pH	<u>One foot.</u>			<u>Three feet.</u>			
		5.57			6.05		
	<u>Symbol</u>	<u>P.P.M.</u>	<u>lbs. per acre.</u>	<u>Symbol</u>	<u>P.P.M.</u>	<u>lbs. per acre.</u>	
	NO ₃ -N	H-	12	60	L-	2.5	10
	NH ₄ -N	T	---	---	T-	---	---
	P	T	---	---	VVL	0.06	5
	K	L-	15	150	T	---	---
	Ca	VH	400	4000	L	75	750
	Mg	VVL	2	10	VVL	2	10
	Al	H	5	250	H	5	250
	Fe (Ferric)	VL	0.5	5	L	2	15

Finca Near Baja Vista

pH	<u>One foot.</u>			<u>Three feet.</u>			
		6.10			6.41		
	<u>Symbol</u>	<u>P.P.M.</u>	<u>lbs. per acre.</u>	<u>Symbol</u>	<u>P.P.M.</u>	<u>lbs. per acre.</u>	
	NO ₃ -N	T	---	---	T	---	---
	NH ₄ -N	H-	10	100	M	2	20
	P	VVL	0.06	5	VVL	0.06	5
	K	M-	20	200	L	15	150
	Ca	KH	500	5000	T	---	---
	Mg	H	50	250	M-	10	50
	Al	H	5	250	H	5	250
	Fe (Ferric)	T	---	---	L	2	15

Plantation back of Beneficio

pH	<u>One foot.</u>		<u>Three feet</u>	
		5.40		6.00

Symbol	P.P.M.	lbs. per acre.	Symbol	P.P.M.	lbs. per acre.
NO ₃ -N	T	---	T	---	---
NH ₄ ⁺ -N	L-	1	VL	0.5	5
P ⁴	T	---	VL	0.125	10
K	L-	15	VVL	---	25
Ca	VVL	25	T	---	---
Mg	T	---	L-	5	25
Al	H	5	H	5	250
Fe (Ferric)	VL	0.5	L	2	15

Provisional Table of Rating for Soil Nutrients

The numerical values present are more or less representative of average soils in Honduras and Guatemala. (Conducted in October and November 1936.) The figures are given in terms of "pounds per acre" for the depth indicated. (Morgan's Standards, Universal Soil Testing System). The following groups are suggested:

For Surface Soils 0" - 6".

	<u>Definitely Unfavorable</u>	<u>Normal</u>	<u>Perhaps Excessive.</u>
NO ₃ -N (Nitrates)	3 or less	15-60	over 100
NH ₄ ⁺ -N (Ammonia)	,No lower limit	2-10 *	" 50 *
P (Phosphorous)	Less than 75	175-300	" 600
K (Potassium)	" " 150	350-600	" 1200
Ca (Calcium)	" " 1000	2500-5000	" 12000
Mg (Magnesium)	" " 50	200-500 **	" 1000
Al (Aluminium)	Over 100	10-25	30-100 ***
Mn (Manganese)	Less than 5 or over 50.	5-15	20-50
Fe (Iron Ferric)	Less than 5 more than 50	5-15	20-50

For Sub-surface Soils 10" - 16".

	<u>Definitely Unfavorable</u>	<u>Normal</u>	<u>Perhaps Excessive.</u>
NO ₃ -N	Not significant	2-10	over 25
NH ₄ ⁺ -N	" " "	Less than 10	" 10 *
4			

cont'd.	Definitely		Normal	Perhaps
	Unfavorable			
P	Less than 50		100-200	over 400
K	"	" 100	175-250	" 600
Ca	"	" 600	1200-3000	" 6000
Mg	"	" 25	125-250	" 600
Al	Over 100 **		10-25	30-100 ***
Mn	Less than 2			
	Over 50		5-15	20-50
Fe (Ferric)	Less than 2			
	Over 50		5-15	20-50

Note- * Such concentrations of Ammonia, except within 2 - 3 weeks after application of Ammonia, urea, or organic nitrogen, etc. indicates unfavorable biological conditions in the soil.

** These amounts of Magnesium are undesirable if the Calcium is less than 1500-2000 pounds per acre.

*** These amounts of Aluminium are undesirable on account of toxicity, especially in acid soils.

Therefore, by using these tables for normal soils, we can calculate more or less the required nutrients necessary for optimum growth in the Guatemala soils. Whether this holds true with the nutrients required for Cinchona growing, remains to be seen.

Taking each soil in order, we find that the Chimborazo soil is definitely low in phosphates and magnesium, slightly low in potassium and an excess of aluminium. This high concentration of aluminium in an acid soil of a pH 5.70 is often very dangerous, especially when the phosphate content is low. The phosphate acts as a buffering agent preventing the toxic forms of aluminium from being absorbed by the plant. By adding phosphates and magnesium fertilizers to the soil, it would not be necessary to add potassium at this time as there is sufficient in the lower depths to maintain the plants requirements.

If this low Mg/P ratio is not increased, it is most likely that the high aluminium content would eventually precipitate the remaining low concentration of the two elements, the result being that a toxic condition might arise to hinder further growth. In order to prevent such a condition from arising, it would be advisable to add 200 pounds of available phosphoric acid in the form of super phosphate per acre and 200 pounds per acre of magnesium sulphate. This added concentration would balance the Mg/P ratio and eliminate any toxic effect from the high concentration of aluminium.

The same treatment holds true for the Loja soil, with the exception that the phosphoric acid in the form of super phosphate should be increased to 250

pounds per acre. As there are only traces of potassium in the lower depths, it would be advisable to add some muriate of potash within the next year.

When the calcium content is high and the phosphate and magnesium concentration low, it is always advisable to add these two fertilizers.

With the soil from the Finca near Baja Vista, it can be seen that all nutrients are in order except the nitrates, phosphates and ammonia. This high concentration of ammonia indicates that there is some definite biological factor out of order. This high ammonia content should only be seen after heavy application of organic nitrogen fertilizers. If there has been no addition of nitrogen, one would conclude that there is poor aeration from water-logging, which retains the ammonia in the soil solution. If this high ammonia concentration was corrected, the nitrogen and phosphate content might become normal. If after correcting the faulty ammonia level, the two elements do not come back to normal, it would be advisable to add 160 pounds of nitrogen in the form of urea or calcium cyanamide and 200 pounds of super phosphate per acre. If calcium cyanamide is added, special care will be necessary in the application, as this type of fertilizer will burn the plants if placed too closely. It is best applied by spreading out thinly between the rows.

If the analysis of the soil from the Plantation back of Beneficio is in order, it would then seem that this soil is definitely out of line in all respects, and poor results from plants grown on this type of soil might be expected. Considerable toxic effects from plants grown on this type of soil may also be noticed. Both the phosphate and the magnesium are so low that their buffering action upon the high aluminium content is nil.

Therefore, using only the analysis as an indication of the soil fertility, it would be necessary to correct the level of nitrogen, phosphate, calcium and magnesium. Urea or calcium cyanamide applied at 160 pounds per acre, super phosphate, 200 pounds and one ton of lime stone or $\frac{1}{2}$ of this amount if hydrated lime is preferred.

If Cinchona trees are showing good growth on these soils, especially on the soil from the plantation back of Beneficio, the analysis may be definitely out of line. One outstanding factor which would interfere with the analysis is the high aluminium and iron concentrations. When there is a high concentration of either of these two salts, rapid soil tests are not to be relied upon, low readings being obtained for the other elements present. This is especially true when such a condition arises in acid soils.

The above comments on these soils are merely suggestive and a true picture cannot be drawn without understanding the conditions that actually exist in the field and the type of growth prevalent. Owing to the fact that very little is known of the soil types and the nutrients required for good growth and production of Cinchona trees in Central America, fertilizer experiments will be necessary in order to throw some light upon the picture.

If considerable difficulty has been encountered in the growing of Cinchona under the present conditions, it would first be advisable to have a complete analysis of the soil. This would include the major and minor elements as well as the chloride and sulphate content. The minor elements though only essential in minute quantities, are just as important from a growth standpoint as the major ones. A complete analysis may give a more definite picture of the conditions that actually exist within the soil and help to clear up some of the problems regarding better growth of Cinchona trees.

John A. Stuart

John A. Stuart

TELA RAILROAD COMPANY
Office of the General Manager

La Lima, Honduras

November 3, 1941

Dr. Wilson Popenoe
La Lima

Dear Doctor:

While talking to President Carías about the agricultural school on October 31, I told him that his employee Córdova had asked you to help them out with some Cinchona plants. General Carías was very pleased when I told him that you had kindly offered to do this. The General said he would tell you of the different places where he would like to have the Cinchona planted so that you could select the one you considered best. Later on, at your convenience, please take care of this.

Dña Elena wants to plant a few tung oil trees in some of their country properties near Tegucigalpa. If you think you can supply the right seed from what we have in Honduras, please do so. If not, let's get some from the States. I could ask Junior Zemurray to send us some. I imagine that a sackful of seed would be more than sufficient for what doña Elena wants.

Carlos Izaguirre, who was with the General and Mrs. Carías when I spoke to them, asked me if we could let them have one or two sacks of peanut seed for the Government to plant. I told him I would ask you to fix them up.

For your information, I am asking Walter Hamer to send me a can of peanut oil from Santo Domingo which the above people would like to have.

Also for your information, I think the Company will have to give to General Carías a Brown-Swiss bull and maybe a couple of heifers.

Yours very truly

W. E. Turnbull

W. E. Turnbull

*Pres Carías
200 B. Honduras
200 A. Tegucigalpa
2 cabs peanuts.*

La Lima, Honduras

AIR MAIL

November 6, 1941

Dr. Wilson Popenoe
% United Fruit Company
Guatemala City

Dear Doctor:

I have delayed considerably in sending you the Código de Instrucción Pública. The reason for this is that we had to copy a tremendous number of reforms to the Código and these had to be looked up in the official Gaceta. You will note that the Código de Instrucción Pública has been reformed so many times that there now does not exist a bona fide Código published in one volume. Licenciado Moncada has made an index to the reforms which will enable you to refer back to the original Código when studying the laws covering education in Honduras. If you are studying a particular section in the Código book which I have forwarded, it will be necessary for you to look at the index of the typewritten reforms which I have also forwarded you, to determine whether or not the particular clause you are interested in has been reformed. In other words, to get anything out of the two documents I have sent you will have to continue to make cross references.

After these two documents have served your purposes would appreciate it if you would return them to us here; however, if you would like to keep these, we will make other arrangements for duplicates. The documents will be forwarded to you by air express from Tegucigalpa, and I would appreciate it if you would let me know that you have received them.

Yours sincerely,

W L Tailon

W. L. Tailon

Gen Manager's Office
La Lima

Antigua, Guatemala, 15 Nov 1941

Mr W L Taillon,
La Lima, Honduras.

Dear Bill:

Yours of the 6th arrived some days ago, and yesterday I received the Código de Instrucción Pública and attachments. I am planning to fly to Tegucigalpa about a week from today, and will take these with me and return them to you from there, after I have studied them thoroughly and drawn up a memo as requested by Mr Turnbull.

Please tell Mrs Beasley of my plans as above, so she can hold mail for me and send it to Teguci at the proper time.

Forster has been of great service to Muller at Chimaltenango. He came at just the right time. Muller is making a fine start up there and needed some help on irrigation and a few other features. Forster will accompany me back to Teguci and we will want to get busy right away on the site. We will need to make a topog map of the area where the buildings are to go, so we can draw up preliminary plans of the layout.

Best regards to all of you.

Sincerely,

La Lima, Honduras

December 2, 1941

Dr. Wilson Popenoe
c/o. Tela Railroad Company
Tegucigalpa, D. C.

Dear. Dr. Popenoe:

Some prominent ladies in New Orleans, members of the Garden Society there, are interested in native flowers of Honduras and Guatemala, especially those which will be in bloom on or about the first of March or the end of February. They have a flower show and some special meetings at that time, and want to have a special display of tropical blooms from the Central American countries. Naturally, they want something showy and typical of Honduras. They will want the names of the blooms they could have brought into New Orleans for the first of March well in advance in order to secure a special permit for the entrance of these blooms.

A Mrs. C. A. Williams of New Orleans, a good friend of Mrs. Zemurray who is also a member of the above mentioned Society, is interested in the information requested and, because of the short time for handling should blooms be sent up, will you please let me know as soon as possible what they might expect. It may be that sending blooms from either of these countries would not be warranted -- you, of course, know.

Sincerely yours,

V. E. Scott

CB: Dr. W. Popenoe - La Lima

W. E. T.

Communications Bureau

COPY OF MESSAGE SENT

To NR 10 Jep 32 Ufco Havana Dated Dec. 8, 1941

Gonzalez: We have ready for shipment to Abel Fernandez, P.O. Box 1090, Havana, three hundred tung oil seeds, weight four pounds STOP Give declaration and necessary entrance papers. W. E. TURNBULL

NR 11 Jep 37 La Lima Dec. 8, 1941

Cia. Bananera de Costa Rica - San José

Chittenden: We have ready to send airexpress to Ing. Luis Grúz, San Pedro Montes de Oca, one hundred tung oil seeds, weight one-half pound STOP Give declaration and necessary papers required. W. E. TURNBULL

NR 12 Jep 33 La Lima, Dec. 8, 1941

Magfruitco Santa Marta

Hamer: We have ready to send airexpress to Prof. E. Ruiz Landa, Medellin, Colombia, one hundred tung oil seeds, weight one-half pound STOP Give declaration and necessary papers required. W. E. TURNBULL

NR 15 Jep 35 La Lima, Dec. 8, 1941

Dr. Weir - Consulate United States of America

Caracas, Venezuela

We have ready for shipment airexpress to you one ~~hundreds~~ thousand tung oil seeds weighing twenty pounds STOP Give declaration and necessary papers required for entrance. W. E. Turnbull

cc: Dr. Wilson Popenoe ✓

Research Department
La Lima, Honduras
December 9, 1941

Dr. V. C. Dunlap:

Peanuts

The following are the results obtained to date in our experimental peanut plots.

One acre each of the following varieties of peanuts was planted on June 24, 1941, in section 19, Tacamiche:

Plot 1 - Valencia
" 2 - Virginia Bunch
" 3 - Spanish
" 4 - North Carolina Runner

Previous to planting, this area was disced and harrowed. The first three varieties listed above were planted in rows 3 feet apart and seed 8-10 inches apart in the row. For the North Carolina Runner a spacing of 18 feet was used in the row because this particular variety spreads to a greater distance in the row, as its name denotes.

The early growth of these peanuts was retarded somewhat as a result of grass and weeds. As you will recall, this particular area was heavily fertilized with Cyanamid May 10, 1940. Thus, it has been difficult to keep down the rapid growth of grass and weeds, necessitating constant clean cultivation to insure a good crop of peanuts. During these operations the soil was constantly kept banked around the plants to facilitate their pegging down.

The Valencia variety belongs to the bunch type of peanuts with an upright habit of growth. It was very irregular in maturing, and the ripened peanuts started sprouting before the younger pods had a chance to develop. This gave us a crop high in "pops", thus reducing the yield. This variety matured in approximately 90 days.

A yield of 21.67 bushels per acre was harvested, which is just under a 5-year average yield of the same variety in Southern Texas.

Weight per bushel	- 24# unshelled
Yield per acre	- 21.67 bushels or 520#
Weight of shelled nuts per acre	- 325#
Percentage of hulls	- 37.5%
Yield of oil	- 40.56%
Yield of oil per acre	- 131.82#

December 9, 1941

The Virginia Bunch variety matured in approximately 120 days. The growth of this variety was excellent, and a more even maturity of the large pods was obtained.

Weight per bushel	-	22# unshelled
Yield per acre unshelled	-	715# or 32.5 bushels
Weight of shelled nuts per acre	-	552.5#
Percentage of hulls	-	22.7%
Yield of oil	-	44.94%
Yield of oil per acre	-	248.29#

The Spanish variety has been rather slow curing as a result of the rainy weather. Picking by hand has just been completed. The results are rather disappointing for this particular variety. The maturing period was approximately 120 days.

Weight per bushel	-	30# unshelled
Yield per acre unshelled	-	363#
Percentage of hulls	-	33.3%
Weight of shelled nuts per acre	-	242#
Yield of oil	-	44.93%
Yield of oil per acre	-	108.7#

The low yield originated without a doubt from the scattered stand of this particular variety in the field, though the yield of nuts per plant was about average.

The North Carolina Runner is a total loss. This variety was still in the field when the Chameleon River came up and completely inundated the plants. We tried to salvage as much of the nuts as possible for seed, but by the time the soil had dried out most of the peanuts had rotted in the ground. This variety was late in maturing as a result of the rainy weather, so we were unable to harvest the crop before the flood came up.

This variety has a prostrate type of growth, with the nuts scattered along the vines. Growth in the field was vigorous.

It should be mentioned that all of the varieties were retarded somewhat at the start, but responded fairly well after the weeds were kept under control. There was some injury to the roots from too close cultivation and from ants. At the beginning of the rainy season a pathogenic fungus was observed on the Spanish and North Carolina Runner varieties and identified as a rust.

We believe that by planting peanuts in January we should be able to harvest two crops before the rainy season sets in. At the present time harvesting and curing operations have been greatly delayed by the rainy weather now in progress.

Further recommendations include the planting of seed closer (8 inches apart) in the row, especially the Spanish variety. This, of course, only refers to the bunch type of peanuts. The rows should be

spaced far enough apart to allow for cultivation with a mule-drawn cultivator. Such an implement, besides keeping the weeds down and throwing the loose soil up around the plants to facilitate pegging, will greatly lessen the cost of hand cleaning.

The following figures cover expenditures for planting and harvesting these 4 acres of peanuts:

<u>June</u>		
1. Cleaning before planting		\$22.50
	Clearing land of weeds and banana regrowth, using tractor and farm labor.	
2. Application of water		33.12
	One field ditch was constructed. One application of water was made previous to planting.	
<u>August</u>		
1. Cleaning around peanut plants		81.20
	Rapid growth of grass and weeds made it necessary to clean by hand. Farm labor was used.	
2. Banking peanuts		31.94
	After weeding, peanuts were banked by farm laborers - 3 hoes were purchased.	
<u>September, October, November</u>		
1. Cleaning		142.45
	Two farm men were used to control grass and weed growth. Hoes were used.	
2. Watchman		<u>93.70</u>
	After peanuts had formed, one watchman was placed on duty.	
	Total farm labor	\$404.91

All labor charges to peanuts are on a day labor basis.

<u>Supervision and Department labor</u>		
1. Supervision	\$190.00	- approximate estimate for 3 months
2. Planting	7.00	- " "
3. Hauling by tractor	5.00	- " "
4. Harvesting	24.00	- " " (By hand)
5. Cleaning and picking	<u>135.00</u>	- " " " "
Total		<u>361.00</u>
Total expenditures up through November		\$765.91
Cost per acre		191.48

The results in general on the growth and yield of the first three varieties are encouraging and warrant further trial in the field

on a slightly larger scale. The importance of further investigations is shown by the low yields obtained here in our plots as compared to average yields obtained in the Southern States. We believe that the yields of all four varieties can be greatly increased with proper cultural methods and earlier planting - say January.

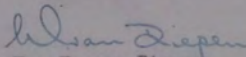
The cost per acre is very high and must be reduced to make this a profitable cash crop for the small farmer here in Honduras. Clean cultivation has been rather an expensive and major item, but we are of the opinion that by adopting the use of a one-mule cultivator between the rows and starting the practice of clean cultivation early, we can keep the grass and weeds down at a fairly low cost.

Since peanut oil is getting to be one of the more important edible oils, with good prospects here in Honduras on the lighter type alluvial soils abandoned because of Panama disease, I suggest that a larger area - say 20 acres - be allotted us in order that we may continue further studies of peanut varieties.

If it is decided to continue the growing of peanuts this coming year on a larger scale, it will be to our advantage to purchase a peanut planter (approximately \$35), a 5-shovel cultivator (\$18), and a peanut picker. There is no available price on the latter implement.

The plan in mind being to plant the early part of January and harvest in April, by so doing there may be a possibility of replanting immediately after the harvest and obtaining a second crop before the October rains set in.

There is no doubt that the present crop was planted too late. The rainy weather now in progress has made it difficult for us to harvest and cure most of this peanut crop.


Wm. T. van Diepen