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N. J. GABRIE E HIJOS

SAN PEDRO SULA, HONDURAS, C. A.

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Especialistas en Conservaciones de Frutas Finas Mermeladas y Cristalizadas
ASEPTAMOS AGENCIAS EXCLUSIVAS

San Pedro Sula, 16 de Noviembre de 1939

Sr
Dr Wilson Papence

Kingston Jamayca

Muy estimado Dr

La Presente es para saludarle en union de su nueva estimable Esposa y diciendole mochas felicidades

Querido Dr hase mocho tienboque no he sabido nada de Udun viejo Amigo que nonca lo Ulvido y cada Ves que Voy a Lima Pregonto por Ud en la Oficina de Agricolas y a Mis amigos Don Carlos Turbol y al Dr Dunlob en el Laporatorio Centificos casi cada Semana Voy a La Lima una ves en la Semana vamos entregar Frutas a Nuestro Amigos y Clientes

Haura voy a Contarles de mi Quinta actualmente tiene la Mejor Prodeccienes de Frutas y si se Puede consederar es la Primera en su Jenero en Toda la Repoplica y quisas en Centro America aquel pedaso de tiera pedrajosa esta dando un Predocto satesfactorio en las exspecciones que han avido en Hondores hemos Trienfado como de Primer Premio en Diplomas Medallas de Oro Y Platas

Adjonto mi follieto pequenio y corto para su conocimento Pronto sacare utro mas amplio y mas exstenso si Ud decia escribir algo con Gosto lo poplico y me va despensar en esta Feyeto no he puesto su Nompre por descuido pero aun en el Proxccimo con el mayor gosto aplare de su ayoda que Ud me has facilitado y si tiene algon Cliche o fotograpado mandameles para Honrar nuestra Pajina si Ud no le tiene inconveniente

Segon me avisaron Varios amigos de La Lima me dicen que Talves pronto estara Ud en Hondores ruegole cuando Ud esta en la Lima me avisa o si Ud llega a San Pedro no se Olvida de su casa que le tiene a la Orden y Un dia de campo en mi quinta para tomar un lonch

Querido Dr esta semana me llegan de Florida un pedido de Plantas de Arpoles Frutales Florales y cipreses como 400 Plantas salen del New Orleans en el Vapor de la United Fruit Co para Puerto Cortes el dia 29 de esta mes y el 7 de Deciembre apre la 111 Tercera Exspocicion en Comaguela tengo que estar con mis Prodocto

Ruegole que si Ud Tiene algenas semillias de Arpoles Frutales o Plantas en Jamayca tanbien nesecito unas Plantas de Nuesmoscado canelas alcanfor y Otras Plantas puede mandarmelas a la Oficina agricolteras en Lima Nueva si no es Molestia para Ud y las semillias Puedes mandarlas Por Paquetes Postales de Ud Atto Y Ss Ss

Antigua, Guatemala, 23 Dec 1939

G.P.Chittenden Esq.,
Cia. Bananera de Costa Rica,
San José de Costa Rica.

Dear Mr. Chittenden:

Mr, Turnbull has informed me that I am to go to Costa Rica as soon as possible after New Year's, to assist you in working up a program for miscellaneous crops on some of the former banana lands of the Atlantic side. Mr. Turnbull has further told me that he would like me to be there a week or so before Messrs Zemurray and Pollan come down, so that I will have looked over the ground and be able to assist you in discussing the problem with them.

I have been hoping to spend a week or so at La Lima before going to Costa Rica, but the latter takes precedence and if there will not be time I will come right down from Guatemala City, as early in January as necessary. On receipt of this, would you be good enough to advise me at the Guatemala City office by radio, regarding the time you think I should reach Costa Rica in order to carry out the program mentioned above? I will adjust my plans in any manner necessary to get there a week ahead of Messrs Zemurray and Pollan.

With personal regards,

Sincerely yours

Wilson Popenoe

cc Mr W E Turnbull

La Lima, Honduras

December 8, 1941

Mr. A. A. Pollan
Boston, Mass.

Dear Mr. Pollan:

COSTA RICA - ATLANTIC COAST

Referring to the above: the government has talked a lot about our lending them a million colones, supposedly to give assistance to the Atlantic coast -- Limón planters and other people. Certainly nothing worth while has been arranged for or perhaps even thought out. Chittenden and I mentioned to President Calderón Guardia that we might lend them Dr. Popenoe again to look into this matter. While talking to Dr. Popenoe he told me that if the company wanted to do something worth while for Costa Rica regarding this matter, his recommendation was that we allow an expenditure of $5,000 (dollars) yearly to be spent in making seedbeds for various crops that might be grown in that zone and distributing young plants to people who are really anxious to work and try something new. Dr. Popenoe's idea would be to place this work under the supervision of some competent man, perhaps like Joe Permar.

Dr. Popenoe remembers when the United Fruit Company and the International Railways of Central America in Guatemala spent $5,000 each annually for similar work and the excellent results accomplished.

I would be glad to know your ideas regarding Dr. Popenoe's recommendations which strike me as being very sound, even though I appreciate that in Costa Rica the government and certain people connected with it would much rather have a considerable amount of money to dispose of according to their own ideas.

Yours very truly

W. E. Turnbull

cc Mr. G. P. Chittenden
Mr. N. E. Sanderson
Dr. Wilson Popenoe

San Jose, de Costa Rica
22 January 1940

Mr. Chittenden:

AN AGRICULTURAL PROGRAM FOR THE ATLANTIC COAST

In attempting to formulate the bases of an agricultural program for the Atlantic coast, we had best consider separately the Old Line, and the flat lands between Siquirres and the ocean. I have gone over both these areas in a general way and discussed the problem with a number of well-informed Costa Ricans.

Siquirres - Limon - Estrella area. Experience with annual crops such as corn and rice has been very discouraging in all this area, due mainly to climatic difficulties. I do not see very much hope in any of these crops. They will be grown here and there on a small scale, but the hazards are great. The following three permanent crops seem worthy of further study:

Rubber. By selecting well-drained areas of moderately heavy soil it should be possible to grow rubber on a total area of very considerable size in this region. The future of this industry in Costa Rica is not yet certain, but as will be mentioned further on, the prospects to me seem excellent.

Abacá. Our experience at Almirante shows that this crop can be grown very successfully on rich alluvial loams throughout this area. Provided we are successful in extracting the fiber economically, this crop has an excellent future.

Cacao. Now the major industry throughout this zone. It will continue to be produced. Its future depends mainly upon two factors, (1) the price which obtains in the world market, and (2), increased production per

unit of area and better quality of product. We can do nothing about the first, but there is always the hope that prices will improve. Regarding the second point, we could build up the industry through supplying selected seeds likely to give trees of superior yield and better quality cacao.

All of the above crops can be grown by the small farmer. I feel that we can do a good deal to assist him. We can and should guide him in the selection of land for rubber. If we do not do this, many costly and discouraging mistakes will be made. As regards abacá, we should do the same; and it may ultimately be possible for us to handle the extraction of fiber mechanically, to the mutual advantage of ourselves and the small farmer who produces it. With respect to cacao, we could supply seeds of selected strains to the small farmer, thus helping him to get better results from his plantings.

There is one further crop which may have possibilities, but which needs further investigation before it is suggested. This is yuca or cassava. Last year I was informed by the U. S. Department of Agriculture that there is a good market for cassava starch in the United States, and that our government desires to encourage production of this crop in tropical America with a view to buying the product. I suggest we take this matter up with Washington to get details. This is a crop which could be grown over a large area in the zone under consideration.

Old Line area. The lands of this area are better drained and on the whole better suited to general agriculture. Experience with the annual crops such as corn and rice, however, has not been satisfactory, due to the same reasons which operate in the Siquirres-Limon-Estrella zone. It may be worth while to experiment further with rice in parts of this area. We could obtain seed for trial.

Oil-producing plants. There is a keen interest right now in the production of vegetable oils. Plants which have been mentioned as suitable for this purpose are the soy bean, the peanut, ajonjoli or sesame, and sunflower. I am of the opinion that climatic conditions of the Old Line are not very favorable to these crops, but that further experiments should be made. I suggest we obtain seeds of varieties which seem promising and place them with selected farmers for trial.

Rubber. From the standpoint of supplying the basis of a permanent, large-scale agricultural industry I believe this is the most promising crop in sight at present. The Goodyear Company has done a beautiful job of experimentation, and the results shown me by Mr. Klippert convince me that there is every prospect of complete success. The industry in the Far East is still based principally upon seedling trees, which yield only 200 to 300 lbs. of dry rubber annually per acre, and which cannot economically be cut down and replaced suddenly with higher-yielding grafted stock. If an industry is developed in Costa Rica, it will be based at the start upon grafted trees which yield 1000 to 1500 lbs. of dry rubber, and this difference in production will offset the Costa Rican disadvantage of higher wages than those of the Far East.

Mr. Klippert is of the opinion that the climate and soils of the Old Line are excellent for rubber - perhaps even better than those of the major rubber-producing areas of Malaya. This opinion is born out by results obtained from the plantings you made at Cairo in the nineteen-twenties.

There are other advantages for rubber growing in Costa Rica. One of these is the lack of governmental restrictions which exist in Malaya, and which at present make it impossible for the Goodyear Company to utilize much more than 50% of its potential production in that region.

Mr. Klippert states that approximately half of the world's supply

of rubber is produced by small farmers, who sell the latex or the raw product to the large companies who handle the marketing end. He believes that there is a good future in this crop for the Costa Rican small farmer and I can see no reason to question his judgment.

Abacá. The situation with respect to this crop is much the same as in the Siquirres-Limon-Estrella area, except that we must be careful, in encouraging plantings along the Old Line, to see that the right soils are selected. We have had no experience with abacá on such soils as the majority of those along the Old Line, while we have had experience on alluvial soils like many of those in the Siquirres-Limon-Estrella area. I doubt that the brown clays of the Old Line will prove altogether satisfactory. If any development is undertaken along the Old Line we should do our best to guide planters in the selection of lands.

Cacao. The situation with respect to this crop is the same as in the Siquirres-Limon-Estrella area.

Farmers along the Old Line are much interested in live stock, and there is talk of a factory for the preparation of milk powder or condensed milk. Personally I doubt that the potential milk production of this zone is sufficient to justify the establishment of such a factory. Without having gone into the subject deeply, I feel that it might be possible to do more with live stock in this zone than has been done to date, but I doubt that the live stock industry should supplant the crops above mentioned.

The situation with regard to yuca or cassava mentioned above in connection with the Siquirres-Limon-Estrella area applies also to this zone, where it will be possible to grow this crop on a large scale if it develops that a good market for yuca starch exists in the United States.

The above ideas are set down as a basis for further discussion of

this whole problem. There is nothing in the picture which offers hope of providing freights for the railroad comparable to those furnished by the banana industry in its palmy days; but I feel there is a good possibility of working out a permanent agriculture based upon rubber, cacao, and perhaps abacá which will make it possible for all of the best lands to be maintained in profitable cultivation by small farmers, with the larger interests such as ourselves and the Goodyear Company taking a logical and mutually profitable part.

W. POPENOE

San Jose, Costa Rica
February 2, 1940

G. P. Chittenden, Esq., General Manager,
Compañía Bananera de Costa Rica,
San Jose.

Dear Mr. Chittenden:

Attached is an outline of a suggested program for the rehabilitation and agricultural development of the Atlantic coast. This does not purport to contain many new ideas: it is simply the crystalization of numerous discussions I have had during the past weeks with intelligent Costa Ricans familiar with the region and its problems. I have merely attempted to sift the ideas of all these men and to present in concrete form those suggestions which seem practical and worthy of immediate attention.

The most difficult features of this problem are its psychological aspects. The people of the Atlantic region have for many years depended, directly or indirectly, upon the banana for their economic prosperity. No other tropical crop known to me gives the grower such prompt and such lucrative returns as this. It is common knowledge that the cost of planting lands on the Atlantic side has often been recovered by small growers (who do not go in for expensive drainage and other betterments) during the first crop; and that subsequent crops, even where they have been few because of the ravages of Panama disease, have returned handsome profits.

Had it not been for the appearance of Sigatoka disease many small growers would have been able to continue banana cultivation on a short life basis for years to come; but Sigatoka cannot economically be controlled except where production is high and a productive life of several years can be expected, I think everyone is agreed that banana culture on the Atlantic coast offers no hope for the future.

The agriculturists of that region are therefore facing the necessity of turning to other crops, none of which offers the profits of banana growing, and few of which can stand the labor costs which are characteristic of the banana industry. How far we can go in stimulating agriculturists to content themselves with harder work and smaller profits remains to be seen. In any event, it will probably take years to readjust the outlook of Atlantic coast farmers to the new situation.

At present the tendency - so far as I am able to sense a tendency - seems to be in a direction which I consider wholly opposed to the national interest. As you know, live stock raising is the first or primitive stage of agriculture. When Man opens up a new region, where lands have practically no value, he usually starts with live-stock production. Then as he gets more firmly established in his environment, as population increases, and as lands take on greater value, he turns to cereals and other crops which yield a larger return per unit of area.

Most of the small farmers with whom I have talked, in their despair at the passing of the lucrative banana industry, seem inclined to go back to live stock as the easiest way of winning an existence. This means a step backward.

Nor is the Atlantic coast region ideally suited for live stock raising. The climate is too wet. While a wet climate means an abundance of forage at all times of the year, it also means an abundance of intestinal and other parasites which interfere with the production of sound live stock. In the long run, it is gravely to be doubted that results obtained from the live stock industry on the Atlantic coast will prove satisfactory.

Something must be done to stir these people into action. Inherently they are a sound race. But the production of crops other than the bananas and cacao, in the region under consideration, is utterly unorganized at present. The farmer who grows a few acres of corn loses his crop because there is no way of drying it. The man who plants a few soy beans, and gets a crop, cannot sell them because there is at present no outlet for soy beans.

The permanent crops such as rubber and abacá are not yet on a footing which permits of their profitable exploitation. Cacao is in a different position. Though it is not highly profitable at present, people are living on it after a fashion, and with the hope of better prices will doubtless continue to plant in a small way.. But cacao cannot meet all the needs of the region. A one-crop system is in the long run dangerous, especially when it is a crop such as cacao which is not ideally suited to the climate of this region.

In spite of the pessimistic attitude which prevails in many quarters, something can and should be done for the Atlantic coast. Working along the lines suggested in this program, I feel confident real progress can be made, though it will of necessity be slow. What is required right now - it seems to me - is someone on the ground to stay behind the program, encourage the people, and coordinate progress in general. Today, many of the smaller farmers, including some of the colonists at Guapiles, are so disheartened that they are content to sit in the midst of rastrojo, caring for a few head of livestock, and failing to plant annual or other crops to any extent, because their sporadic efforts of the past have been productive of poor results.

I see no advantage in bringing a foreign técnico into the picture. The chances are against his knowing how to approach the people. Some local man, in whom they have confidence, and who is sufficiently dynamic to push ahead in spite of discouragements, seems far more likely to accomplish results worth while.

It has been suggested that Ignacio Cruz is such a man. He impresses me very favorably. You know him well and can judge better than I. It would be my feeling that such a man, working with technical guidance which we are prepared to give him, would be the best possible method of attacking the problem.

If this suggestion seems practicable to you, and Ignacio Cruz is put on the job, I would recommend that we furnish him with seeds and other propagating material which he could distribute to selected agriculturists, visiting them from time to time to watch their progress: that he consult with our own agricultural men regarding soils, so as to prevent useless investment in areas which we know to be unsuited to a given crop (in this way I feel certain we can prevent much waste of money); and that we supply him with information as rapidly as it is available, regarding opportunities for disposing of the crops produced.

I am sure Mr. Turnbull will be glad to have me continue my contact with this work, if you so desire. I could visit this country from time to time and go over the work with Sr. Cruz, and even when not here in person, I can assist by obtaining seeds for experimental planting.

It will give me real pleasure if I can be of assistance in connection with this project, which I consider a genuine opportunity to be of service.

Sincerely yours

WILSON POPENOE

c: W. E. Turnbull, Esq.

SUGGESTED PROGRAM FOR THE AGRICULTURAL REHABILITATION OF THE ATLANTIC COAST REGION OF COSTA RICA

We can assist in the agricultural rehabilitation of the Atlantic coast in three ways: (1) By investigating the possibilities of marketing crops adapted to, but not now grown commercially in this region, (2) By supplying seeds or other propagating material of new crops, or more promising varieties of crops already known in this region, and (3) By appointing someone to work among small farmers, stimulating their interest and c oordinating the marketing end.

The following crops seem worthy of attention in the immediate future:

Rubber. This seems one of the most promising of all, as a basis for permanent agriculture in the Guapiles-Siquirres area. The Goodyear people have committed themselves to making this cultivation available to small farmers. We should cooperate in every way possible.

Abacá. While its future is still somewhat uncertain, there seems a good chance of this becoming a crop for the small farmer as well as for ourselves. We should guide him in selection of land and could supply propagating material. At the moment we cannot guarantee a profitable outlet. We will have to go slowly until we see our way more clearly.

Cacao. There can be little doubt that this will remain a major crop on the Atlantic coast, at least for many years. New plantings will continue to be made by small farmers. While we cannot guarantee that selected seedlings will in all cases produce cacao in greater quantity or of better quality than the orchard run now obtained, there is a strong probability of raising the general level of production through the use of selected seed. We should grow a good quantity of nursery stock annually and distribute to those growers who have land we consider satisfactory.

Corn. Farmers in the Guapiles area are convinced that they could greatly increase the area in this crop, and make money, if they had some way of drying the corn. Raul Gurdian proposes to put a secadora at Guapiles. We could further the progress of this work by planning some plots for the improvement of seed used. Within a few years time it should be possible to increase production at least 20% per unit area through planting selected seed.

Oil-yielding plants. Soy beans, peanuts, and sunflower have been mentioned as possible sources of edible oils, for which there is a good market within the country. While it is not at all certain that the climate of the Atlantic coast will permit of profitable cultivation, we should encourage trials among small farmers by supplying seed of types most likely to prove satisfactory in this climate.

Yuca. We understand there is a market for yuca starch in the United States. We are ingestigating this further. If it develops that the price is such as to make the crop profitable here, we should obtain the right varieties from abroad and distribute them among selected farmers.

Rice. All growers agree that this cultivation is extremely hazardous because of climatic difficulties. There still seems to be a possibility, however, that varieties other than those which have been tested might prove more successful. We should introduce such varieties for trial by selected farmers.

This is sufficient for a start. We will undertake to keep in touch with developments in other tropical regions, and add to the above list of crops for trial as information suggests. The major objective at present is to prevent the Atlantic coast from drifting backward, i. e., into livestock raising on a primitive basis, which seems to be the tendency at present, and which cannot in the end result in raising the standard of living, nor prove satisfactorily profitable from a national standpoint.

San Jose, Costa Rica
7 February 1940

O. P. Chittenden, Esq:

Re: TUNG OIL

Today's issue of "La Tribuna" carries an article on the front page, stating that the United States government is interested in stimulating the production of tung oil in Central America, and that a commission of técnicos will shortly visit this country to see what can be done here. "Economic assistance" from the American government is suggested, for those who wish to plant tung oil trees.

This tree was introduced into the United States by David Fairchild and I was closely associated with its progress in northern Florida for several years. When you sent me to Honduras in 1925 to establish Lancetilla Experiment Station, one of the first crops with which we experimented was tung. We planted all three species which yield commercial oils, viz:

Aleurites fordii, from China, source of most of the world's commercial tung oil.

Aleurites montana, from farther south in China than Aleurites fordii, also a source of commercial tung oil, not held to be as good as that of Aleurites fordii.

Aleurites trisperma, from the Philippines, hence a tropical species, which furnishes an oil of low quality which we thought might have some value.

Aleurites fordii started off well, but after two or three years ceased to develop satisfactorily and we were never able to bring any trees into production. Aleurites montana grew well, and we still have a planting of several acres, now 14 years old. When these trees first came into bearing we thought they looked hopeful, but they have never produced sufficiently large crops to be of any commercial value. Aleurites trisperma, being more tropical than the

other two, has given a satisfactory account of itself so far as growth and production are concerned, but we have never found reason to believe that it has good commercial possibilities.

In addition to the above experiments, we distributed seed and trees of Aleurites fordii and Aleurites montana, particularly the last-named, in Honduras and Guatemala, hoping to find a climate in which one of them would grow and produce satisfactorily. So far as I have learned, all results have been negative to date.

In my travels about the Caribbean, I have had occasion to observe the behavior of these trees in a number of regions, and I have yet to see satisfactory crops of either species produced within the tropics.

In "Tropical Agriculture", December 1939 (published at the Imperial College of Agriculture in Trinidad, B. W. I.,) there is a lengthy review of the behavior of tung oil trees in various tropical countries. This review is definitely discouraging.

I therefore feel extremely doubtful regarding the possibility of producing tung oil commercially at a profit in Costa Rica. So far as the Atlantic coast region is concerned, certainly all our evidence is against it. Nor can I feel hopeful regarding the meseta central, even at fairly high elevations, until I see evidence to counteract the observations I have made in Guatemala and other countries, where these trees have been tested up to elevations of at least 5000 feet.

Due to the disturbed situation in China, there has been a great deal of interest lately in the production of tung oil in the western hemisphere. While further experiments on a small scale are always to be recommended, I feel we have absolutely no grounds for recommending commercial planting anywhere in Costa Rica.

WILSON POPENOE

San José, 10 February 1940

G.P.Chittenden Esq:

Agricultural Rehabilitation of Atlantic Coast

Assuming that Boston approves our starting work along lines we have discussed, and assuming Ignacio Cruz or someone else is employed and put on the job, I suggest we start immediately as follows:

CACAO. Get Joe Permar to collaborate in selecting the best material on our farms for propagation. I am inclined to think the Ecuador plot offers the best possibilities, but Joe will know more about this than I, and together with Scoltock and with Bookout's advice can make a sound choice. Prepare a good nursery and raise about 50,000 seedlings under lamina shelter, for distribution to small planters as soon as ready.

In the meantime, work widely among small growers on the cultural end. If Cruz does not know enough about cacao culture already, get Scoltock and Permar to indoctrinate him fully. Then let him show growers how to clean up their trees prune them properly, remove shade where it is too dense, an generally lay the ground for better production. This may not accomplish a great deal from the practical angle, b seems to me it would assist in creating the impressio we are on the job. I would spend a good deal of ti this in the next few months.

CORN. Try to see that the secadora or drying plant at Guapiles becomes a reality. Assuming that it is definitely in sight, get Cruz to talk about seed selection for improvement

of yields. We cant actually do anything with the crop now being planted, but we can lay the ground. I will try to be here when the next crop is maturing, at which time Cruz and I will go over the region and buy up some good stock and pass out some selected seed to approved indivuals. We will also start some ear-to-rowperiments on several farms with a view to building up superior stock.

RICE. This also depends largely upon the secadora. But in any case we want to introduce additionalvarieties for trial, and as soon as you pass me the word, I will commence rounding up some seed in other countries and send it here.

YUCA. If the answers we get to the inquiries I have put out (copies of these answers are to come to you) let me know and I will arrange for planting material of varieties suitable for starch production to be sent here, and Cruz can place them with approved planters for trial.

SOY BEANS AND OTHER OIL SEEDS. As soon as the program is approved, let me know and I will order a number of promising varieties for trial, in quantities sufficient to distribute among ten or more approved farmers.

GENERAL. We cannot do much about rubber and abacá for the time being. As regards the livestock problem, our action will depend largely, I take it, upon how much local support this project receives. Present indications are that it is going to receive a great deal. But there does not seem to be a great deal which we can contribute to its success. It will probably go over without any help from us. You will have to decide as the situation develops. Since it is obvious that the only assistance needed or wanted is financial, I cannot

see much that we can do except to give it our moral support to whatever extend the situation may indicate. We can study this phase of the problem when I come here again. Perhaps it will be desirable to carry out the idea of supplying one or several bulls for breeding purposes. The livestock industry in that region cannot develop rapidly unless the government throws a lot of cash into it, which to my mind is not likely.

W.Popenoe

San Jose, April 11, 1940

VIA AIR MAIL

Dr. Wilson Popenoe
United Fruit Company
Kingston, Jamaica

Dear Pop:

I wonder whether you met Shapiro, the man who was making two potatoes grow in Cartago where one grew before. He came in the other day and asked for a job and I told him there wasn't any. He put up a pretty good talk and I gave him an application blank to fill out, which I enclose herewith.

If you did meet him, what did you think of him, and could you see in him a possibility for our Agricultural Aid Program on the Atlantic Coast?

Please return the application form.

Best regards,

Sincerely,

G. N. Collins

enclosure

VIA AIR MAIL

KINGSTON,

April 17th 1940

PERSONAL

G.P. Chittenden Esq.,
General Manager, Compania Bananera de Costa Rica
San Jose, Costa Rica

Dear Mr. Chittenden,

I have just returned from a sofourn in Venezuela, followed by a visit to Trinidad which I made primarily for the purpose of getting up-to-date information on cacao improvement, to be used if it is decided that we are to go ahead with the rehabilitation program for the Atlantic coast. To-day I have received your letter of the 11th.

I did not meet Shapiro. The afternoon before I left San Jose, when you took me around to say good-bye to Fernando Castro, he spoke to me at some length regarding this man, and it was a source of regret to me that I had not known earlier of his presence in the country, so that I could have made his acquaintance. Fernando seemed to think he is exactly the right sort of person; practical, and not afraid of work.

I don't know just how your plans are coming along, but if there is a good likelihood that we will go ahead I should think it might be well worth while to keep Shapiro in mind.

I am finishing up here in Jamaica about the end of the month and am then going back to Guatemala, where I am being loaned to the Cinchona project on the West coast. As far as I know, there is nothing lined up for me beyond that. Indirectly I hear that Messrs. Zemurray and Pollan have not yet visited Costa Rica, so I do not know whether or not you have yet

had the opportunity to take up the rehabilitation program with them and get their views on it. If we are to go ahead, I believe I could profitably spend some time on the job in late summer and autumn. It is my recollection that the new administration takes office in August, and I should think we would want to time our activities so that we would start work shortly after the change takes place. But you will know best about that.

I think I have made it clear that I cherish no illusions regarding the Atlantic coast job. It is a tough one. Naturally we cannot start people planting any new crops commercially until we are sure they are safe bets; but it seems to me we can accomplish something by focussing attention first on the improvement of cacao and such things as corn, which we know are relatively safe; then poco á poco trying out other and new prospects. Even though we can't accomplish a great deal, it seems to me the problem is so acute that we should make a determined effort to contribute something towards its solution. I know you feel this way about it yourself.

After May 15th my address will be in care of the Guatemala City office. If things take definite shape and you think you can use me for a time later on, I hope you will let Mr. Turnbull know so that he can take the matter into consideration when planning my program.

Warmest regards to all of you. Helen and I still look back on our stay in San Jose as one of the pleasantest months we have had.

Sincerely yours,

San Jose, April 23, 1940

VIA AIRMAIL

Dr. Wilson Popenoe
c/o United Fruit Company
Kingston, Jamaica.

Dear Dr. Popenoe:

I have your letter of April 17 and was glad to hear from you.

I did not feel that there was any point in going ahead with our plan until the incoming administration had taken hold; especially in view of the fact that people were taking it for granted, in a headlong manner, that we were going to make loans.

You may be sure that I will let Mr. Turnbull know when I think you can help out here.

Best regards to Mrs. Popenoe and yourself.

Very truly yours

R. P. Chilton

VIA AIR MAIL

KINGSTON,

April 29th 1940

G.P. Chittenden Esq.,
General Manager, Compania Bananera de Costa Rica
San Jose

Dear Mr. Chittenden,

Further with regard to the rehabilitation of the Atlantic coast:

We have talked about edible oils, such as soya beans, peanuts, and ajonjoli. As you know, I have been afraid the climate might prove too wet for profitable production of these. It has just occurred to me that the answer may be the African Oil Palm, Elaesis guieensis, which we have been growing experimentally at Lancetilla for the past fifteen years.

This palm will stand the climate of Siquirres and Guapiles, I feel quite confident. It yields an oil which is excellent for culinary purposes, as well as the manufacture of soap and other products. It is exported from the West Coast of Africa on an enormous scale, and because of the presence of vast numbers of wild palms in that region, it would probably not be possible to compete in the world market; but there should be a snug little business in the production of edible oils for Costa Rican consumption, and of raw material for soap manufacture. I believe this is something which might interest Fernando Castro. Perhaps he has already given it consideration.

The African oil palm exists in a number of varieties, some better than others. I think we have a good collection at Lancetilla, and we have abundant seed available. It takes about five years from the time of planting for the palm to come into commercial production. This is no worse than the coconut; and I think it likely that the oil palm will thrive on the Old Line while the coconut has a number of enemies which make its commercial planting unsafe, if I am not mistaken.

There are several other things which we have been growing experimentally at Lancetilla which it would be well to try in Costa Rica, if we take up the rehabilitation of that region. And from what I saw in Trinidad, I am by no means convinced that we can do nothing more with cocao. The people at the Imperial College of Tropical Agriculture, who

have been studying this crop intensively for the past fifteen years, are inclined to feel that we would do well to propagate that batch of Ecuadorian cacao which we have at Good Hope. But in doing so, they suggest that we take pods for seed from the center of the planting, so as to get away from cross-pollenized material as far as possible.

With best regards always,

Sincerely yours,

Copy to Mr. W.E. Turnbull

La Lima, Honduras
June 3, 1940

Mr. G. P. Chittenden
Cia. Bananera de Costa Rica
San José, Costa Rica

Dear Mr. Chittenden:

Thank you for your letter of May 27th to which you attached a report on the tomato industry in Costa Rica and covering correspondence.

Copy of the report has been sent to Dr. Popenoe.

Yours very truly

W E Turnbull

Copy to Dr. W. Popenoe (with attachment)
c/o United Fruit Company
Guatemala City

A SURVEY OF THE TOMATO INDUSTRY IN COSTA RICA

CONTENTS:

MAURICE L. SHAPIRO
May 20, 1940

SUMMARY AND CONCLUSIONS

1. Tomatoes give promise of being an increasingly important product in northern markets because of their vitamin content. The vitamin content of tomatoes is not appreciably lowered by practises incident to long distance shipping.

2. It is estimated that the total production of Costa Rica for the season January to May 1940 was about 1865 tons and the total acreage about 500 manzanas (875 acres). About five times this acreage would be available for tomato plantings at the present time.

3. Average yields were about 2.1 tons per acre. This figure might be tripled with improved methods of growing the crop. The present rather high percentage of inferior grade of fruit seems also to be due only to the poor growing practises.

4. Production costs averaged about ¢222 per ton of prime fruit. Farmers ask a contract price of ¢300 per ton. The market prices have ranged from ¢600 per ton in January to ¢200 in April and May.

5. Prices could be lowered by increasing yields, improving grades and more efficient disposal of culls.

6. Production practises as outlined in the body of this report are generally emperical and antiquated. The larger yields came invariably from fields that were fertilized and otherwise handled more judiciously. This seems to indicate that improvement of the crop is quite practicable.

7. The limited irrigation facilities and the small market are the most important factors which have prevented expansion of the industry. The common diseases and insects are those known to American and European farmers and for which control methods have already been devised.

8. Suggestions are made for increasing yields and improving the crop by means of better cultivation methods, use of manure, fertilizers, transplanting solutions, certified seed and sets, spraying with insoluble copper sprays, delayed spraying, improved early, wilt-resistant varieties, etc. It would be necessary for the exporter to initiate the experiments since both the farmers and the government are ill-prepared for this work. It is possible that the simplest and most economical solution of the problem of securing adequate yields and lowering production costs would be for the exporter to produce his own crop.

9. Production costs and labor requirements are detailed.

10. A plan and budget for growing the crop using improved methods is offered. The cost per manzana for a 20 mz. unit yielding 200 cwt./mz.(5.7 tons/acre) is ¢1008.60, or per ton of fruit, ¢100.80.

INTRODUCTION

The increasing importance of the tomato in the agricultural and shipping industries is not likely to abate. The United States Department of Agriculture has calculated that for an adequate nutritional program the consumption of tomatoes and

citrus fruits would need to be increased about 70% (15) XX And just as the improvement in production methods, control of field diseases and the introduction of superior varieties made possible the vast tomato canning and shipping industries so the newer developments in tomato horticulture must tend to enlarge their scope.

Emphasis at the present time is laid upon the vitamin content of tomatoes as their most significant advantage for the consumer and it is important to note that under the handling methods involved in shipping the fruit long distances, only small vitamin losses are incurred since artificially ripened tomatoes have nearly the same values as the vine ripened. The following are the figures for the ascorbic acid (vitamin C) content of tomatoes (1).

Green	20 mg/100 g.	(N.B. The daily ascorbic acid require-
Vine ripe	30 " "	ment of the adult is from 28 to 100 mg.
Artificial ripe	25 " "	

In addition to being considered an excellent source of ascorbic acid, the tomato is also held to be an excellent source of carotene (pro-vitamin A) at the stage when the red pigment has been developed. There are certain varietal differences in vitamin content of tomatoes, but it is doubtful whether these need yet be called upon in commercial practise.

Tomatoes are supplied during the American winter from a number of sources: canned stock, including soups, juices and cocktails, shipments from California, Florida, Cuba (2), and Mexico, greenhouse productions and stored fruit. The supplies of the fresh fruit are, however, obviously inadequate and this is due in part to the limited production and in part to shipping and storage hazards. Winter tomatoes usually command excellent prices.

All these considerations would seem to favor the entering of Costa Rican tomatoes into the northern markets, provided they can be produced cheaply, in reasonable quantity, of satisfactory quality and during the appropriate season. This study is an attempt to discover whether these requirements can be met.

METHODS OF STUDY

About forty farms in fifteen important commercial regions were visited and numerous short conversations were held with farmers, workers, dealers and business people generally in many of these regions. In addition, nine detailed case-histories were taken of representative tomato plantings and of these eight were sufficiently complete to serve as the main basis of this report. Interviews were also held with the managers and technicians of two tomato products factories and with a number of government officials, concerned with various aspects of the industry. Seed dealers were also consulted. Notes were taken of observations in the fields, markets and shipping centers. Some laboratory experiments in certain problems of tomato physiology which were made last year in San Jose and Cartago and several years of experience with the application of improved practises to Costa Rican agriculture served as a background in evaluating the findings.

XX Numbers in parentheses are literature references

PRODUCTION DATA

Estimations of the local acreage and yields are bound to be crude, first because of the absence of any critical statistical service and second because of the limitations of this study. However, the following very rough calculation may be offered.

Cartago, with a population of about 10,000, may be considered as a typical consuming town area or an area which may be rated as having double the consuming power for vegetables in proportion of the national population. Merchants in the municipal market cooperated in estimating an average weekly consumption of 3 tons from January 1 to May 21, the normal crop season, for the town population, including 2.5 tons per week sold in the market and .5 ton per week sold in shops outside the market. If then the national consumption be calculated on the basis noted above for the entire population of 600,000, this national consumption per week for this period would amount to 90 tons, or for the 20 weeks, 1800 tons. To this figure should be added about 40 tons which is annually consumed by tomato sauce and ketchup manufacturers and which is obtained from the seasonal crop, and about 25 tons which is exported to Colon. The total so obtained, 1865 tons is submitted most hesitantly, as an estimate of the seasonal production for the entire country.

It will be appreciated that in estimating average yields and acreages, the difficulties encountered were well nigh insuperable. At the time this study was begun, at the end of April, the peak of the crop had passed and field observations were of small use. The limited time allotted for the study was another difficulty. But most of all, it should be pointed out that tomato plantings are almost inveriably small patches of from one to two acres. The largest field in the country is about 14 manzanas (24 1/2 acres) and it is unique. It is doubtful that more then 10% of the plantings are as large as 3 manzanas. The rule seemed to be 3/4 to one manzana. Even these small areas are seldom planted at one period, but it is customary to stagger the plantings in order to produce throughout the season. Yields very widely even in neighboring fields. Mountain soils have a tendency to occur in a great diversity of types in even a small area and where their agricultural history is as unstable as it is in the vegetable industry of this country where land is taken over from pastures, it may be, or field crops such as corn or beans or sugar cane, or even from abandoned coffee plantations, it is impossible to expect uniformity. Production methods also, are somewhat individualistic and in the absence of standard techniques not only do neighbors differ in planting dates, fertilizer, pruning and irrigation practises and cultivation methods, but the same farmer may change his methods from year to year and may even vary them in portions of the same small plot according as weather, the market, labor conditions, fantasy or inertia dictate. In trying to arrive at sound data it was found necessary, too, to discount reports heavily weighted with the usual farmers' bias, often unconscious. The small farmers were generally suspicious of the questions, the large farmers and merchants were generally over-enthusiastic about the project and their contributions tended to assume the form of proofs of its feasibility.

With these warnings of the necessarily incomplete character of the data to be reported, the following estimates are made for the season January to May 1940.

Yields per unit area varied so widely within each region that it was not

possible to be certain of any region as being significantly favored. Particularly is this true when possible yields under improved methods are considered. If the yields for the entire country are lumped, a fair average would seem to be 75 cwt. per manzana (about 2.1 tons per acre). The actual distributions ranged from 31 cwt./mz. to 440 cwt./mz. It seems likely that yields can be stabilized at a minimum of five or six tons per acre by using improved methods.

A comparison with the yields of certain tomato growing regions of the United States may prove interesting:

Illinois (1927-36)	3.2 tons/acre
Michagan (1923-35)	4.9 (market crop)
Michagan "	5.6 (canning crop)
Texas (1934-38)	2.0 (market crop)
United States	4.0 (canning crop)
Hawaii	3.8 (market crop)
Costa Rica (1940)	2.1

If the calculations made above are accepted, we may estimate the seasonal tomato acreage as somewhere in the neighborhood of 500 manzanas for the entire country. Since most of the farmers interviewed declared that they could plant about three times their present acreage and since many farmers in all the regions surveyed declared that they would engage in tomato cultivation if a market and a fair minimum price could be assured, it seems safe to allow that 5 times the present acreage would be available for planting, or when the present consumption is subtracted, a minimum of 2000 manzanas could be counted upon for an export trade. These 2000 manzanas would produce 7500 tons under present production methods of which perhaps 60% or 4500 tons would meet grade requirements. This amount could be vastly increased by employing superior varieties, fertilizers and other improved methods and the proportion of superior fruit could be increased by spraying. However, as the cultivation methods grow more demanding, the acreage would probably not be increased quite in the ratio indicated.

Costs of production will be studied in some detail below and are indicated in the table in Appendix I. At this point we may take the average cost of production, including harvesting and marketing to be, in round numbers, ₡500.00 per manzana or ₡133.00 per ton of fruit for the entire crop and about ₡222.00 per ton for the superior fruit, assuming no value for the culls. Naturally, as yields per manzana increase, the cost per ton decreases. This is also true when the proportion of prime fruit is increased. In the data to be presented below it will be seen that actual costs have varied between ₡42.40 and ₡288.00 per ton.

These costs of production must of course be considered in studying both actual and proposed prices. Prime tomatoes for export to Colon have been paid for at ₡200.00 per ton, but farmers have considered this a low price and it was reported that the exporter had difficulty in filling his needs. In discussions in connection with this study, farmers and merchants have been almost unanimous in their estimates that ₡300.00 per ton would be a satisfactory price and, if guaranteed, would stimulate the planting of large areas.

Prices paid to farmers in San Jose this season have been roughly as follows(per ton):

	December	Jenuary	February	March	April	May
Primes	₡600.00	₡400.00	₡300.00	₡300.00	₡200.00	₡200.00
Ungraded	₡360.00	₡240.00	₡160.00	₡140.00	₡100.00	₡100.00

It would seem entirely feasible to lower these prices by reducing production costs and by finding increased uses for culls and second grade fruit. The present market is not, to be sure, very demanding, but since only prime fruit can be handled for export, a larger amount of waste than could be used by the market would be entailed. At the present time three firms are engaged in the manufacture of tomato sauce and ketchup. The two smaller concerns use each about 10 tons of tomatoes per year and have no plans for enlarging their plants. The largest factory (Fabrica del Tropico, Guadalupe) uses about 20 tons per year and is studying the possibility of canning and juice manufacturing. It was estimated that from two to three times the present consumption could be made if the new products were successful. A certain amount of tomato sauce is also made at home in most Costa Rican households. The present consumption of tomatoes even in the cropping season is undoubtedly very much lower than is nutritionally desirable or potentially possible. It is quite probable that consumption of second grade tomatoes could be doubled or more by lowering prices to a point consistent with local wages. One merchant in Cartago submitted the following information on this point:

Season	January-May	June-September	October-December
Average prices (retail)	¢0.10 lb.	¢0.25 lb.	¢0.80
Average daily sales	50 lbs.	20 lbs.	10 lbs.

PRODUCTION PRACTISES

It has been mentioned that production practises are extremely varied in character. The following summary is intended only to focus attention on a number of points which may become worthy of research and exact evaluation if the industry is extended.

Preparation of the land may range from hardly more than clearing and burning of residues from the last crop and immediate setting of the plants in holes broken with the macana (a sort of earth chisel mounted on a long stick) to a complete program of breaking, plowing, disking, harrowing and furrowing, and even including the spreading of manure the year before planting and following. The first of these systems may be defended as a moisture conserving practise. Breaking and plowing if done after the dry season has begun, undoubtedly increases water losses from the exposed surfaces. Furrowing and especially the very high ridges sometimes thrown up has the same effect. On the other hand, aeration would seem to lack where no plowing is practised and cultivations would become extremely difficult. Generally the land is broken, however, either with a plow or in stony land with a pick. Costa Rican practise usually allows for poor preparation of the land by fining the soil in the first cultivation. The principle here would seem to be to plant as quickly as possible at the turn of the season when the rains seem to be passing and before heavy drouth sets in. Even though the soil is left somewhat cloddy, the first weeds are allowed to appear. In about 10 days the first weeding (desyerba) is made with the machete and at the same time the clods are reduced. Where the land is more thoroughly prepared, as a rule several months before setting out, the desyerba is cheaper and it is claimed that the plants suffer less of a check from the transplanting. It must be understood, however, that there is no exact experimental evidence on this point for Costa Rican conditions. In fields where generous quantities of manure was spread, the necessity for irrigation was either eliminated or reduced and yields were also increased appreciably.

Sets are generally transplanted at about four or five weeks of age into the tops of furrows. There exists a prejudice against fertilizing the seed bed of a peculiar anthropomorphic nature. It is pretended that if the plants are started on a luxary ration they will rebel or at least suffer when submitted to the rigors of the open field. This notion is related, perhaps, to the now abandoned theory of the necessity for hardening plants. In a general way, the uneducated farmers are suspicious of fertilizers, but the highest yields reported all came from fertilized fields and where in addition the seed plot had been fertilized. Losses in the seed plots were reported to be excessive, especially due to the ravages of a small black ant and from inclement weather. No-one seems to have thought of producing sets under glass or cloth as a protection from rain. There is some business in raising sets for sale, but the quality of these sets is sometimes very poor and is seldom of assured variety and freedom from disease.

Certain farmers practise direct field seeding, planting some 4 seeds to the hill and thinning and transplanting where necessary. Direct seeding is also done where there is a lack of sets for the field or in some late plantings. It seems to be quite practicable and deserves some study for it is not only much cheaper than transplanting but would probably serve to decrease disease infections.

The plants are set out at spacing rates which vary from 4,500 to 10,000 plants per manzana. The usual number is 6,000 which gives a distance of one plant per square yard and a half. Planting distances must depend upon the available water supply, the soil fertility and the plant size and it is probable that exact experiments would increase the efficiency of practises in this respect. The field is generally irrigated after setting out the plants, but the newer discovery of the value of watering the transplants with nutrient solution has not yet been tried in this country. This matter will be discussed further under "Improving the Crop."

Cultivations are universally done with the machete and shovel. They vary in number from one to four but the number seems to obey no rule whatever. Modern practise has been tending, especially in the United States, toward fewer and more shallow cultivations and the question might well be studied here. In some instances cultivation consists merely of establishing the irrigation channels, in others a very high ridge is formed, the purpose of which is reputedly to keep the fruit from the ground.

Irrigation is practised by allowing the water to run down the furrows. For this reason it is common to select fields which have a gentle slope. Since this system requires relatively large quantities of water and since the amount of available water in the country is generally limited in the dry season, particularly near the towns and settlements, irrigation is the most serious problem faced by the grower. Most growers consider it to be absolutely essential and allow from three irrigations per week in the regions near the coast (Barranca) to once every two weeks in the cool uplands, particularly where manure has been applied (Cartago). Most of the fields received water once a week but some were not irrigated at all and the rule seemed to be that soils of high organic content or which were fertilized with generous quantities of manure did not receive irrigation. While it is not possible to state whether or not piping would pay in regions less favored with water as a means of increasing the efficiency of applications of limited amounts, it is suggested that irrigation facilities of

some sort should be provided as a safeguard against periods of excessive stress, even where optimum quantities of manure, comport or green manure are used. Another attack on the problem of water deficiencies would come from using early varieties instead of the very late varieties now used, and the establishment of windbreaks. It should be noted that the disturbances considered to be due to excessive water losses from the plant, namely, blossom drop and blossom-end rot of the fruit, are rather common in this country.

Pruning and topping are generally practised and staking less often. Since these practises tend to increase sun scald which is no prominent in this country, as well as blossom-end rot and cracking they might well be limited. Recent experiments from a number of institutions in the United States lead to the conclusion that there are no notable advantages to be derived from pruning and staking in field production of tomatoes and they are no longer recommended for most areas and especially where the newer varieties, well adapted for specific regions, are planted. Since these operations are expensive, tend to spread diseases and cannot be assured to increase yields or size of fruit, they are well worthy of critical study. The severe types of pruning ought to be discouraged, if one can judge by the observations made in connection with this study.

Harvesting is generally done twice a week for the local markets. Women and children are often employed for the picking and, although the wage rate was halved or less, it could not be shown that total costs of harvesting were thereby lowered. No doubt this was due to poor management and supervision. It was noticed that excessively large baskets were sometimes used which led to bruising of the fruit. At times fruit was thrown a distance of several yards into the container, with,of course,fatal results. Grading is of the crudest sort for the local markets and usually only the very smallest fruit and that too damaged to withstand hauling to market is sorted out. In a general way increasing distance from market was correlated with improved grade because of the hauling problem. In effect, the grading operation is performed by the retailer, although this is not commonly recognized. A few farmers selected their better stock for the market, particularly where they were able to dispose of culls to the tomato products manufacturers. Rather severe price penalties were imposed on the ungraded stock as compared with the better grades and it is probable that grading is profitable even for the local markets.

Shipping to market is done by truck, ox-cart, horse-back or hand-barrow, according to the facilities available or the nearness to the market. The largest commercial areas, in the Pacific highlands, are all traversed by paved roads and the railroad is nowhere far from the farms. Aside from the truck, the usual shipping vehicles are apt to be unsatisfactory for handling a product of prime quality. One farmer possessed an ox-cart mounted with springs and either this or a horse-drawn wagon with springs would be very desirable. The usual packs are in heavy wooden boxes holding from 30 to 50 lbs. While these would probably be too expensive for export, they do offer excellent protection for the fruit,although the larger size of pack is too hazardous. The present exporter to Panama uses the 30 lb. boxes.

Marketing is done twice a week. Although nominally three grades are established, primes, seconds and culls, depending much more on size differences than on the appearance of the fruit, in practise most fruit is sold ungraded.

Prices are established for each sale usually after considerable bargaining and since there is absolutely no way of the farmer's knowing the condition of the crop in other parts of the country, the market is definitely in control of the wholesalers. Culls are usually left in the field except for what can be sold to the manufacturers, but some sound fruit of small size is handled in the market for those who use it to make sauces, although the current tomatoes are preferred for this purpose.

Seed is generally obtained from regular dealers who import from the United States, mainly from Burpee's in Philadelphia. An inconsiderable number of farmers took seed from their own productions. A few farmers insisted on certified seed and these, as may be supposed, were individuals who used also fertilizers and other improved methods and who obtained the better yields. A certain amount of complaining was heard on the quality of the seed obtainable and in a few instances it was observed that the field contained mixtures of varieties. One dealer, indeed admitted that he sometimes mixed odd lots of seed. It must be observed that the price of seed is quite low, lower than is offered to the American farmer by Burpee's, but it is not necessary perhaps to argue some suspicious practise from this. In only one instance was seed treated (with Mortegg)although it was admitted that losses in the seed bed were excessive. On the other hand, the quantity of seed generally used (4 oz.per mz.) is about equal to usual American requirements. However, in plantings on the coast (Barranca) about a pound of seed was used per manzana because of the ravages of a black ant, severe wilting and,no doubt,damping off diseases.

With unimportant exceptions, the varieties planted were limited to Stone and Marglobe. Both are late season varieties of good shipping quality, but Stone has largely been abandoned by American growers because it is susceptible to fusarium wilt (an important disease in Costa Rica, incidentally). Since Stone is usually replaced by Norton, a wilt resistant selection, in American practise, an attempt was made to determine whether the substitution was made here as well. The dealers reported that this was not likely since they had previously experimented with Norton and found it even later than Stone and much less satisfactory. The rather imposing problem of wilt would also seem to argue the legitimacy of Stone. Marglobe is wilt-resistent, of better color and form than Stone, and still the most important variety in the United States, although it is slowly being replaced by varieties more specialized for the various regions of the country. Marglobe is preferred, as a rule, in the regions west of San Jose and Stone in the regions east. Dealers stated that they had experimented with other varieties, principally Pritchard, Ponderosa and Chalk's Early Jewel, but with no success. However, it cannot be allowed that their rather crude trials are sufficient to close the variety question.

Fertilizers are not usually applied but the higher yields were correlated with fertilizing. Some farmers applied lime and,indeed, the question of liming has been a favorite stamping ground for the local scientists. Except for my own limited work on this problem I know of no exact experiments that have been made on the effect of liming. Field observations show that some regions respond in a definitely unfavorable manner and I think this is as much as can be said on the matter, at the present time. Next to lime, wood ashes and the ashes from sugar cane bagasse were used. Both lime and ashes were generally either broadcast or applied in the furrow and then thrown to the ridge at cultivation. The amounts used varied and were determined by the vaguest of principles. Manure was applied

by the best growers in generous amount, namely from 20 to 30 cubic meters per manzana. Some preferred to spread it on the field just before plowing, others, especially where the amounts were limited, to place it about each plant. One farmer plowed it in the year before and fallowed the land until planting time. By this means he was able to forego irrigating. This last farmer also applied Ammophos (11 - 48) to the plants in divided applications totaling about 200 lb. per manzana. Yet other farmers supplied either small quantities of Ammophos or Humber Fish Manure (3 - 4 - 10) to the plants. It is impossible to judge these practises adequately but it seems likely that notable results will be obtained when the problems of fertilizer amounts, time of application and methods of application are standardized for each region on the basis of controlled experiments.

Spraying, as may be supposed, is rarely done. Of all the farmers interviewed, but two owned spraying equipment and these were portable tanks of low pressure so that the work they could have done would probably be of small value. But even of these two farmers, only one did any spraying this year and he sprayed only once. These two farmers held that persistent spraying with Bordeaux Mixture and with nicotine sulphate would raise yields considerably but the rather bothersome task of overseeing the work did not pay while prices were so low. It is more likely that their faith in the effects of such spraying as they could do was purely romantic and that they were themselves in mortal and commercial doubt. The newer work on spraying will be referred to later in this paper.

It is generally understood that tomatoes are by no means demanding in the kinds of soils that may be used. A wide variety of textures and conditions was observed from sandy soils to the heaviest clays. The best yields, however, were obtained on the clay loams which had been in cultivation for some time and were permeable and fertile, retentive of water yet with good drainage. Many fields were exposed to constant winds and few had regular windbreaks except for buildings or temporary crops such as sugar cane. The better farmers, however, understood the need for wind protection.

It was shown that plantings are generally about a manzana or less in size. Since the size of the enterprise may be important as an indication of the stability of the industry, of its resources and potentialities for improvement, a word should be added on the subject. Most farmers, planted on their own land and those who rented were usually unable to invest in the better practises. As a rule, tomato growers specialized in vegetables which means that the farm was organized so as to give constant attention to the crop. Some plantings, however, were made as a cash crop by coffee planters, sugar cane and rice planters and by dairy men, and these, although less interested perhaps in the details of the work, were better able to afford fertile soils, adequate preparation of the land, fertilizers, certified seed and good shipping practises. While the regular vegetable growers were most interested in the possibility of an export trade, the larger field crop planters declared a willingness to enlarge their tomato crops. The present crisis in the Costa Rican coffee industry because of the war would, no doubt, influence many coffee planters to engage in some tomato growing if a market could be assured.

No regular rotation practises exist, although many farmers understand the need for rotations. Since most tomato plantings are made by vegetable growers, vegetable rather than field crops are usually planted after tomatoes and this practise of following an intensively cultivated crop with an intensively cultivated crop leads to severe erosion and impoverishment of the land especially where no fertilizer is used and explains in part the unsatisfactory average yields.

It is possible that the new vegetable oil industry of the country will suggest the use of peanuts, soybeans, sesame, sunflower, etc., as a rainy season crop to alternate with tomatoes, particularly if tomato plantings are to be enlarged.

LIMITING FACTORS IN PRODUCTION

The tomato is a warm season, drouth resistant plant which does not, however, set fruit under drouthy conditions. It is rather sensitive to wide variations from the optimum carbohydrate-nitrogen ratio and an overbalance causes either excessive vegetative growth with poor fruit setting or else poor growth with consequent inability to mature fair crops. These physiological limitations are the basis of the usual cultural practices, irrigation, pruning and topping and fertilizing in the less fertile soils. Modern agricultural science suggests some new attacks on these problems (5), the most fundamental of which is the production of varieties better adapted to the particular environmental conditions including the ability to resist diseases and insects. And here a word ought to be said about the climatic factors of Costa Rica as related to the tomato.

Tomatoes can and are grown in every part of the country from the coast to an altitude of about 1500 meters, the limit of the coffee and sugarcane plantings. The most important commercial plantings are concentrated in the zone between Alajuela and San Jose, between the altitudes of 900 to 1100 meters on the Pacific side of the Continental Divide. In this region the coldest temperatures average between 26.5 degrees to 25.5 degrees and the warmest somewhat above 32 degrees C. It is interesting to note that the optimum temperatures for the growth of the tomato are between 24 and 31 degrees and these temperatures are also optimum for the Fuscarium wilt organism which however is inhibited above 33 degrees and below 21° (7). The preference for the wilt-resistant Marglobe variety for this region is explained by these data. The Cartago region which is at least 3° cooler than San Jose is able to plant the wilt susceptible Stone variety with somewhat less danger. The coastal regions, although with higher temperatures than the optimum for the growth of the plant, are comparatively free from the most serious diseases.

Now the Pacific side of Central America is distinctly drier than the Atlantic and the dry season of the Pacific begins from one to two months earlier, namely in November. This factor not only makes for greater freedom from the humidity diseases such as Septoria leaf-spot but the increased evaporation causes a cooling effect so that regions of the same altitude are cooler in the Pacific than on the Atlantic side. On the other hand, lack of moisture is a more serious limitation for the Pacific region. Dates of planting and cropping are also defined by the climatology, for the Pacific region is able to begin cropping in November and has its best crops until March or April, while the Atlantic regions (Cartago to Ujarras) usually crop from January to May. The intermediate regions (San Juan de Tibas, Moravia, San Isidro) are intermediate in their cropping dates. The end of the cropping season is determined not only by the arrival of the rainy season, which begins from two weeks to a month earlier in Puntarenas than in San Jose and gradually works its way across the country from west to east, but also by the diminishing availability of water as the dry season progresses.

All these considerations suggest that for an industrial scale of operations the Pacific Meseta is the most indicated region for the early crop and perhaps for producing sets for distribution and the Atlantic region, particularly from Taras to Agua Caliente and perhaps even to Orosi, may be relied upon for the late season crop.

Another aspect of the climate which may become important in view of certain

recent botanical developments is that of the invariable day length in the tropics. It has been found that the tomato reacts to changes in day length and that by supplying the seedlings with an additional light period to total a fourteen hour day for from two to six weeks, the yields, earliness and quality of the fruit can be improved (4). In my own experiments an additional 3 hour period of light from an ordinary mazda lamp almost doubled the rate of growth of seedlings in San Jose in June 1938.

Irrigation facilities are commonly the commercial limiting factor. With the growth of the country, the demand for water by the towns and villages has grown to such an extent that irrigation of fields has been forbidden by law although it is in practise tolerated to a large degree at least. But it is not possible to undertake extensive plantings requiring irrigation without running foul of water rights held by towns, by the sugar processors, by the dairy farmers, by the electric companies. To be sure, irrigation methods are of the crudest and most wasteful and by use of a minimum of engineering facilities, vast possibilities might be opened. Another solution, and it appears to be a practical one, is the use of manure and green manure to increase the water holding powers of the soil, especially if cropping is limited to the first few months following the end of the rainy season. The use of early varieties would help in such a program as would that of windbreaks and the limiting of cultivations to the removal of weeds without exposing large surfaces of the soil. Any practise which would increase yields would also serve to increase the efficient use of water.

The diseases and insects of the tomato in Costa Rica are largely the familiar pests of the United States (17) and this suggests that no insuperable problems need be expected. Aside from Fusarium wilt, the most important fungus is Early blight which attacks the leaves and fruit and is responsible for field losses of at least 70% of the crop. The disease should be controllable by spraying. Septoria leaf-spot is not important in the dry season, but defoliates the plants in the rainy season.

The following diseases were identified in the course of this study:

Fusarium wilt	(Fusarium lycopersici)
Early blight	(Alternaria solani)
Septoria leaf spot	(Septoria lycopersci)
Leaf mold	(Cladosporium fulvum)
Bacterial spot	(Bacterium vesicatorium)
Mosaic	(virus)
Damping off	(Pythium, Rhizoctonia)

Blossom-end rot, which is thought to be caused by a physiological disturbance of the water relations of the plant at frui ting time, is fairly common. This disease is known to be aggravated by deficient irrigation, by excessive soil nitrogen and by staking. Sun scald, caused by exposure of the fruits, is also common and could be controlled by reducing the amount of pruning, and by better care in picking, that is, the avoiding of turning the plants over so as to expose the fruit. The following are the physiological disturbances noted in the field: Blossom end rot; Blossom drop; Sun scald; Cat-face; Blotchy ripening; Pockets.

The principal insect enemy is the tomato fruit worm. Ants also devour the seeds, it was reported. The insects were not identified but the major pests

are here listed:

Tomato fruit worm (gusano)
Cut worms (gusano)
Several beetles, especially coccinellids (vaquita)
Flea beetles (pulgon)
Squash bugs and other hemiptera (chinche)
Aphids (afis, piojo)
Leaf cutting ant (Atta) (hormiga)

There is no reason to suppose that an intelligent spraying program would not cope with the diseases and insects in adequate degree.

Other limiting factors in production which have already been suggested and which will be further studied under "Improvement of the Crop" are the poor cultivation methods including the inadequate use of fertilizers, lack of spraying facilities, the use of poor quality of seed, unsatisfactory varieties, etc.

Perhaps the most serious limitation to the expansion of the industry has been the market. Data have been offered to suggest the size of the market. While returns have generally been satisfactory this year (largely because yields were somewhat low but not too much so) the experience has been that even slightly larger crops cause prices to fall very rapidly and when yields are poor and prices improve, the consumption is severely checked by the low paying ability of the consumers. Perhaps the wealthier farmers could take the industry over, using improved methods and producing large quantities for sale at a lower price, but since the tomato requires rather constant attention and has a relatively long cropping season which demands overseeing both at harvest and in marketing, the interest of these wealthier farmers is not aroused.

Manufacturers are also limited in their use of tomatoes by the narrow market for their products although they do export to some extent. It is possible that the foreign market in Latin America, at least, could be exploited more efficiently and in planning for large scale production of tomatoes, this aspect might well be investigated as a means of disposing of culls. Encouragement of the firms which have studied canning, juice and cocktail products might prove helpful.

Exports have been reported above. In previous years some fruit was exported from Puntarenas to Panama and some even from Atenas (I think) to Holland. The Banco Nacional de Costa Rica made, in January 1936, an experiment in exporting 10 boxes of green tomatoes to New York. Total expenses were $171.00 and a loss of $69.00 was realized. The produce reached its destination in excellent condition. Sr. Bernardo Iglesias of the Banco, who kindly supplied these data, declared that he believed the venture might have succeeded if the packing had been less luxurious and on a larger scale, and if better control could have been exercised over the marketing of the product. During the last war tomatoes were shipped to Panama in weekly quantities of some 12 carloads having an average value of about $25,000.00.

A further limitation to the industry in Costa Rica is the poor grading system which causes large losses to the dealers and consumers, keeps prices unreasonably high and reduces confidence and prevents the consumer from establishing a reliance upon tomatoes.

IMPROVEMENT OF THE CROP

Two major factors serve to demonstrate that yields of tomatoes in Costa Rica can be increased in appreciable degree: first, the fact that certain farmers consistently obtain fair crops, and, second, that the size of the crop was correlated in general, with the number of improved practises, although it is difficult to evaluate these practises in themselves or to be sure that they have a cumulative efficiency. Again, it is fair to assume that the methods devised for attacking the problems of tomato culture in Europe and the United States will be of help in Costa Rica. In testing each separate practise we have, at least, the advantage of the notable advances in plot technique and statistical method with which to measure results, and a vast literature of experimental work from which to draw for practical suggestions. In addition, the object lesson of the enormous tomato industry of the United States should not be lost.

Recent advances in the theory and practise of handling the soil factor (14): preparation of the land and cultivations, have shown in more and more convincing fashion that the classical recommendations of a "thoroughly prepared seed-bed" and "frequent shallow cultivations" cannot be accepted without reserve. To a large extent dry-season agriculture should follow the same objectives and, it would appear, the same practises, as Dry Farming: the encouragement of water penetration by keeping the soil loose during the rainy season; the prevention of excessive water losses through transpiration by restricting weeds; the prevention of evaporation losses by reducing the amount of cultivation to a minimum. This last has the additional benefit of avoiding the rapid destruction of crop residues and the exposure of the soil to wind erosion. It also reduces costs. While it is not possible to offer a specific program that would meet these requirements, it is suggested that such experiments as may be projected include the following:

Preparation of the land:
1. Early versus late plowing.
2. Deep versus shallow plowing.
3. Disking and harrowing versus disking alone.
4. Early versus late plowing-under of manure.
5. Manure versus green manure.

Cultivation:
1. Number of cultivations
2. Machine versus hand cultivations
3. Deep versus shallow cultivations.

Irrigation:
1. Correlation of soil moisture with yields.
2. Frequency of irrigation
3. Irrigation requirements under varied fertility levels

In the raising of sets, several new conceptions have recently entered American practise: certified sets, disinfection of sets and artificial lighting of young plants.. Direct seeding in the fields is another. Whether or not it would pay to distribute sets among the growers as several American canning firms have undertaken to do, only experience can tell. But the aim should be to have the grower use sets of the highest quality and he should at least be taught how to produce these. Sets certified by state authorities in the United States are

required to be planted from disinfected certified seed, the plant bed to be sprayed and also examined for freedom from virus and other diseases. The question of spraying will be treated below. Seed treatment was done by but one farmer in the present survey and the material used was of doubtful value. It would be easy to determine the most effective treatment for local conditions. Fertilizing and lighting of sets might well be tried and the Georgia treatment of immersing sets in a 1:3,000 mercuric chloride solution for 5 minutes would seem to be useful where sets are to be shipped or even for immediate transplanting(8,p.80).

The starter or transplanting solutions which consist of high phosphoric acid nutrient solutions with which the transplants are watered seem to be a most important discovery (5,10,11,12), and well merit trial here. The production of sets in sand culture under sash might prove useful if intensive culture should be found desirable.

Pruning, staking and topping are rapidly being abandoned in favor of the use of varieties so well adapted to the local conditions that these expensive and dangerous (from the point of view of disease infection) practises become unnecessary (5). And while it is not probable that it would be necessary or commercially feasible to undertake the breeding of new varieties or even the selecting of strains of superior adaptation, tests with the major types now available might yield very valuable results. Particularly, trials ought to be made with the newer early and second-early, the drouth resistant and the special green-wrap types (10).

Fertilizers are so important a factor in improving the crop that a rather complete program of experiments is bound to be necessary. In this, the newer work on the effects of fertilizer placement should be investigated.

1. Fertilizer formulae
2. Amounts
3. Delayed applications
4. Placement and size of particles
5. Amounts and placement of manure
6. Minor elements

Spraying to control insects and fungi have been notably advanced by the findings of the New York Agricultural Experiment Station that tomatoes are sensitive to alkaline sprays and that Bordeaux mixture must therefore be replaced by the insoluble copper materials and also that it is quite practicable to delay spraying of tomatoes until the plants show signs of blight infection(6). In any event, if it is to be done at all, spraying must be done by high pressure machinery and this probably means that either plantings must be made in large units or a spraying service for the farmers must be instituted. It is possible,indeed, that on the basis of whether or not spraying is found to be advantageous, may depend the decision of whether or not fruit ought to be purchased from producers or grown by the exporter.

The stage at which fruit should be harvested for long distance shipping has been studied (16) and the general agreement is that although green tomatoes will color satisfactorily in storage the flavor remains insipid. Fruit picked at the turning stage will not keep quite as long under ordinary conditions but the flavor is superior. Caruso and Harvey (3) who studied the effects of wrapping tomatoes, found that the storage life was increased by wrapping and that the spread of storage rots was retarded thereby. Wright et al (16) recommend that

tomatoes at the turning stage be stored and ripened at 55° F. Grades and details of picking, shipping and storage practise would depend upon the market even more, perhaps, then upon the producer.

COSTS AND LABOR REQUIREMENTS

In Appendix I are summarized the cost of production data as collected in the field. The various items represent estimates made by the farmers themselves. Unfortunately, it is difficult to calculate significant statistics from these limited data first because the number of sets of data is too small and second, because soils, cultivation methods, wage rates and yields and distances from market differs so widely. The average total cost of production per manzana ($515.00) has, however, a standard error of but plus minus $56.00 and the average total cost per hundredweight ($5.84) has a standard error of but plus minus $1.38. Those farmers who produced 100 cwt. or more per manzana had an average cost per hundredweight of $3.61 although their costs per manzana averaged somewhat higher than those for the entire group.

Labor requirements as reported by the farmers are cited in Appendix II. As a rule, the dry season crop of tomatoes does not meet with difficulties of labor scarcity since the picking of coffee comes at the beginning of the dry season between November and January. The tomato crop also has a rather constant labor demand from planting to picking time, particularly if the plantings are periodic.

Work animals were invariably oxen and it required from two to four days to prepare the land, depending on whether the land was disked and harrowed or not. Oxen can be rented at about $7.00 per day. Only one farmer used a tractor.

The cost of materials such as imported fertilizers and spray materials is undergoing a change at the present time because of the war. Most farmers bought these materials in very small quantities and paid excessively high prices for them. Manure is obtainable at $5.00 per cubic meter but if the demand should increase the price would certainly rise. For this, the solution would be the making of compost.

Hauling charges averaged $0.035 per cwt. per kilometer when tomatoes were shipped by truck.

The local market is accustomed to use the outer wooden shipping boxes in which gasoline cans are packed for shipping tomatoes. These are heavy, expensive, limited in number and unattractive in appearance. The standard American lug could easily be made in this country from a pattern. Several woods would be satisfactory for the purpose, perhaps jaul (a sort of live oak) being the most indicated.

A plan and what is considered to be a conservative budget for growing the tomato crop using improved methods is outlined in Appendix III. According to the figures there presented, a ton of prime tomatoes could be produced for about $100. This is one-third the contract price that farmers are asking.

Respectfully submitted

APPENDIX I

COSTS OF PRODUCTION PER MANZANA

	Rio Segundo	(2) San Blas	Barranca	Tejar	Ujarras	Moravia	Pavas	S.Antonio de Belen
Rent	¢500.00	¢100.00	¢ 25.00	¢125.00	¢ 30.00	¢100.00	¢50.00	¢200.00
Preparation of the land	42.40	60.00	125.00	12.00	72.50	28.00	34.00	22.50
Seed	4.00	4.00	15.00	4.00	4.00	4.00	4.00	4.00
Raising sets	(1) .95	2.00	5.00	2.00	2.00	2.00	2.00	(4) -
Transplanting	5.40	16.00	25.00	20.00	15.00	24.00	12.00	15.00
Fertilizer	200.00	-	-	125.00	-	21.00	-	32.00
Cultivations and irrigation	39.60	150.00	112.50	40.00	60.00	54.00	120.00	72.00
Harvesting	72.00	100.00	112.50	90.00	55.00	36.00	225.00	108.00
Shipping	43.00	15.50	30.00	87.50	68.85	168.00	15.00	100.00
TOTAL COSTS	¢932.35	¢446.50	¢450.00	¢505.50	¢307.35	¢437.00	¢492.00	¢553.50
Yield cwt./mz.	440	31	60	175	81	112	75	100
Average price (weighted)	¢ 11.00	¢ 10.00	¢ 21.00	¢ 14.00	¢ 5.00	¢ 14.50	¢ 18.00	¢ 19.75
TOTAL INCOME	¢4840.00	¢310.00	¢1260.00	¢2450.00	¢405.00	¢1624.00	¢1350.00	¢1975.00
NET INCOME	¢3907.65	¢136.50 (3)	¢810.00	¢1944.50	¢ 97.65	¢1187.00	¢ 858.00	¢1421.50
Cost/cwt.	¢ 2.12	¢14.40	¢ 7.50	¢2.89	¢3.79	¢ 3.90	¢ 6.56	¢ 5.54
Number of manzanas planted:	14	3/4	2	1	3/4	3/4	4	3

(1) Including fertilizer
(2) Very stony land
(3) Loss
(4) Direct planting

APPENDIX II - LABOR REQUIREMENTS IN MAN-DAYS PER MANZANA

	Rio Segundo	San Blas	Barranca	Tejar	Ujarras	Moravia	Pavas	San Antonio de Belen
Preparation of the land	18	30	60	6	39	14	17	15 (4)
Raising sets and transplanting	4	9	8	11	9	13	7	10
Cultivations and irrigation	22	75	45	20	32	27	60 (3)	48
Harvesting	40	50	45	45	29	18	300	72
Yield, cwt./Mz.	440	31	60	175	81	112	75	100
	(1)	(2)	(1)	(2)	(2)	(2)	(2)	(1)
Wage scale	¢1.80	¢2.00	¢2.50	¢2.00	¢2.00	¢2.00	¢2.00	¢1.50

(1) six hour day
(2) eight hour day
(3) women at ¢0.75 per day
(4) direct planting

APPENDIX III. - SUGGESTED PLAN FOR IMPROVED GROWING OF A CROP

(20 manzana unit yielding 200 cwt./mz. of primes)

	Man-days per mz.	Cost per Manzana
Rent - land and store-room	-	₱ 150.00
Clearing	8	16.00
Breaking	3	6.00
Plowing	1½	3.00
Disking and harrowing	1	2.00
Use of oxen - 4 days at ₱7.00		28.00
Raising sets	1	2.00
Transplanting	8	16.00
Desyerba	6	12.00
2 Aporques - 8 man days each	16	32.00
Irrigations - 1.2 man-day x 16 weeks	8	16.00
Seed - 1/4 lb. certified		6.00
Manure - 20 cu.meters at ₱5.00		100.00
Fertilizer - 200 lb. Ammophos		50.00
Hauling of manure and fertilizer		40.00
Application of manure and fertilizer	3	6.00
Picking and packing	50	100.00
Crates - 200 at ₱0.75		150.00
Hauling to market - 200 cwt. at ₱0.25		50.00
Seed treatment 1/10 oz. Cuprocide		0.10
Transplanting solution - 24 lb. Diammonium phosphate		12.00
Spraying outfit (cost ₱2,000.00)15% of cost divided into 20 mz.		15.00
Spraying materials - insecticide and red copper oxide 3 applications at ₱7.50		22.50
Spraying	3	6.00
		840.60
Plus 20% - interest on investment,,management charges,etc		168.01
T O T A L -		₱1,008.61

APPENDIX IV: A Glossary of Terms used in Tomato Culture in Costa Rica

Almacigal	seed plot
Almacigo	set
Aporque	a cultivation in which the earth is thrown to the plant
Arreflis	culls
Azada	a heavy hoe
Barbacoa	barbecue, a low superstructure of light wood on which tomatoes (are trained
Caja	lit.box, in the tomato industry, gasoline can shipping box
Capar	to top
Cogida	harvest
Chapia	clearing
Chasparria	wilt
Chinche	chinch or squash bug
Deshijar	to prune
Desyerba	a cultivation in which the earth is fined about the plant
Era	wide bed of earth, such as is used in seed plots.
Globo rojo	lit.red globe. Marglobe variety.
Gusano	tomato worm; also cutworm
Horqueta	lit.a forked stick, term used in pruning tomatoes for a branch.
Joboto	white grub
Lomillo del surco	ridge
Macana	an earth chisel mounted on a long handle
Machete	a broad cleaver-like tool used in cultivations
Maquina	a sort of harrow (Pacific Meseta)
Mancha	lit. a spot. Early blight
Manzana	a land measure equal to about 7/4 acres
Manzana	lit. apple. Stone variety.
Paleada	cultivation done with a shovel
Palo	stake
Pinton	fruit at the turning stage
Piojo	lit.a louse. Aphis
Plantén	local term (Paraíso,Ujarrás) for seed bed
Podar	to prune
Pulgon	flea beetle
Quema	lit. a burn. Early blight, also Septoria leaf-spot
Retapa	a light cultivation
Riego	irrigation
Surco	furrow
vaquita	coccinellid beetle

REFERENCES

1. American Medical Association. The Vitamins. 1939
2. Arango, Rodolfo. Cultivo y manipulacion del tomate para exportar. Boletin Agricultura) No. 1. Sia. Agr.Cuba. no date
3. Caruso,Joseph D. and R.B.Harvey, Wrapping tomatoes. Food Industries 7 (8): 375 ff. 1935
4. Hoffman, I. C. New researches of interest to vegetable forcers. Veg. Growers Assoc. of Amer. Ann. Rpt. 29.(1937): 206-214 (1938).
5. Huelsen, W. A. Problems in growing tomatoes in Illinois. Cir. 491. Ill. Agr. Exp. Std. 1939.
6. Horsfall, James G. and John W. Heuberger. Delayed spraying of tomatoes is proved to be feasible. Farm Research (N.Y. State Agr.Exp.Sta.) Vol. V,No.1, p.16. 1939.
7. Jones, L. R., James Johnson, and James W. Dickson. Wisconsin studies upon the relation of soil temperature to plant disease. Research Bul. 71. Wis.Agr. Exp.Sta. 1926.
8. Jardine, J. T. and W.H.Beal. Report on the Agricultural Experiment Stations, 1936. U.S.Dept. Agr. 1937.
9. Morrison, Gordon. Tomato varieties. Sp.Bul.290, Mich.Agr.Exp.Sta.1938.
10. Sayre, Charles B. Use of nutrient solutions and hormones in the water for transplanting tomatoes and their effect on earliness and total yields. Proc.Amer.Soc.Hort.Sci. 36: 732-736. 1938.
11. One and a half tons of tomatoes from fertilizer costing 48 cents. Farm Research. (N.Y.State Agr.Exp.Sta.). Vol. V. No. 2. P.15. 1939.
12. "Starter" solutions for tomatoes. Ibid. Vol.VI. No. 2. p.12. 1940.
13. Strong, M. C. Tomato diseases in Michigan.Cir.Bul.139 (Revised). Mich. Agr.Exp.Sta. 1938.
14. United States Department of Agriculture. Soils and men. 1938 Yearbook of Agriculture.
15. Food and Life. 1939. Yearbook of agriculture.
16. Wright, R. C.,et al. Effect of various temperatures on the storage and ripening of tomatoes. Tech.Bul.268. U.S.Dept. Agr. 1931

Antigua, Guatemala, 15 July 1940

Personal

Mr. G.P.Chittenden,
Compañia Bananera de Costa Rica,
San José de Costa Rica.

Dear Mr. Chittenden:

I am enclosing for your information copies of an exchange of correspondence with Dr E W Brandes of the U.S. Dept. of Agriculture on the subject of rubber in northern Tropical America. As you will gather from my comments to Dr Brandes, it is not my feeling that Honduras and Guatemala offer such favorable conditions for Hevea cultivation as do Costa Rica, Panama and Colombia. Without throwing too much cold water on their plans to investigate the northern area, I intend to do all I can to emphasize the known possibilities in Costa Rica, and to further thereby your plans for rehabilitation of the Atlantic side of that republic. When the government survey party comes to Guatemala and Honduras I may have an opportunity to present the case personally. If you have any suggestions I shall be glad tp carry them out.

We have never tapped any of our trees at Lancetilla and I believe it would be desirable for us to start something along this line immediately. I wonder if you could obtain from Mr Klippert three of the tapping knives he uses, and samples of the tin cups for collecting latex? If you could do so, and send them up to me in care of UFCo, Guatemala City, by air express, I will undertake to get something started right away.

At the moment I am on loan to Merck and Company - until the end of August probably - to organise the work of Cinchona productio in Guatemala. As you probably know, they started experiments her

some five years ago and there is now sufficient material avail able to demonstrate that the possibilities are excellent, and to warrant commercial plantings as rapidly as stocks can be built up. Incidentally it gives me satisfaction to take part in this work, because Cinchona was the only one of the three products which the U S Govt is anxious to establish in tropical America, on which United Fruit had not been of material assistance. Abacá has been entirely in our hands; you have done a great deal to further the rubber project; and by taking an active part in the Quinine work we are raising our batting everage to 1000%. As a good American I know you will take the same pride in this that I do.

When Mr Pollan came through here I talked with him about rehabilitation of the Atlantic side and he did not feel sure that you would have further need of my services there this year. If the situation has changed you had best tip me off so that I will not get tied up in plans for other work when I finish with the Cinchona job next month or in September. I still hope that there will eventually be an opportunity for me to assist you on some phase of the work down there; I have always liked to work with you and always shall do so.

Mrs Popenoe joins in warmest regards to Mrs Chittenden and yourself.

Faithfully yours,

San Jose, Costa Rica
July 18, 1940

VIA AIRMAIL

Dr. Wilson Popenoe
Casa Popenoe
Antigua, Guatemala.

Dear Doctor Popenoe:

I have your personal letter of July 15.

I take it that anything that passes between you and me is unofficial and official communications should be through Mr. Turnbull. Now talking personal:

(1) I will obtain from Klippert three of the tapping knives he uses, and samples of the tin cups for collecting latex.

(2) I want to see you here any time you can get here, and I have consultative work to do with you.

(3) The desirability of Panama and Costa Rica over those countries lying more to the North insofar as Hevea rubber is concerned is as plain as the nose on your face, and since you know this as well as I do, I hope you will be able to convince your friend.

Very best regards.

Very truly yours

R. G. Cleveland

San Jose, July 25, 1940

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

Dear Doctor Popenoe:

Referring further to my letter of July 18th I am sending you via air express to Guatemala City:

3 tapping knives
5 tin cups
5 wire holders

which I have obtained from Mr. Klippert with the compliments of the Goodyear Rubber Company.

Very truly yours,

GP Chitterden

1187 (8-40)

COMPANY, DIVISION 22

FARM REPORT FOR PERIOD ENDED PRODUCT

FARMS	ACREAGE		△ EXPENDITURE		PRODUCTION			COUNT RATIO	COST PER COUNT			COST PER ACRE MTCE. ONLY
	*IRRIGATED	IN BEARING	Farm Maintenance and Disease and Insect Control	HARVESTING	†TONS	†COUNTS	†Counts PER ACRE		Farm Mtce.	Harvesting	○Farm Depn.	
PARRITA WEST												
Parrita	466	854	73375.	11569	160165	155052	181.55	.968	.473	.075	.079	85.80
Barbural	580	729	52090	9552	127397	123917	167.68	.973	.420	.077	.117	70.49
Tiocya	541	671	52351	9551	142393	135049	201.27	.948	.388	.071	.088	78.02
Cacao	615	670	44815	8484	129953	124341	185.88	.958	.360	.068	.061	65.89
Palo Seco	729	904	60536	12884	199517	188814	208.87	.946	.321	.068	.077	66.96
Superintendence			16559									
TOTAL PERIOD	2929	3828	299523	51616	759425	727373	189.62	.958	.412	.071	.086	78.07
TOTAL MONTH	4248	4279	34572	4940	80456	77956	18.22	.969	.443	.063	.112	8.08
PARRITA WEST												
California	334	478	37024	3909	57610	51320	107.35	.891	.739	.075	.150	77.34
Los Angeles	474	675	37693	8858	133938	118959	176.24	.888	.485	.074	.094	85.47
El Tigre		14	350	121	1473	1300	98.86	.883	.269	.093		35.00
La Leona	8	118	11830	2011	23025	20777	176.08	.902	.569	.097	.050	100.25
La Palma			2									
La Union		-			-							
Superintendence			5816									
TOTAL PERIOD	816	1285	113615	14773	216046	192356	149.69	.890	.591	.077	.109	88.42
TOTAL MONTH	1235	1270	10655	993	15760	14208	11.19	.902	.749	.070	.200	8.37
GRAND TOTAL PERIOD	3745	5123	413238	66389	975471	919729	179.53	.943	.449	.073	.102	80.66
GRAND TOTAL MONTH	5483	5549	45207	5933	96216	92164	16.61	.958	.491	.064	.156	8.15

(Quepos, C.R., Nov. 5, 1940 wc/hmd)
DATE

*Average under irrigation included in "In Bearing" figures.
†Counts, Pounds, etc.
Use two lines for each farm. Show last year's figures in red.
△Report even dollars only eliminating cents.
○Farm Depreciation (include Irrigation and Disease Control)

CIA BANANERA DE COSTA RICA COMPANY, QUEPOS {OFFICE / DIVISION

METEOROLOGICAL REPORT, MONTH OF OCTOBER 1940.

DATE	*TEMPERATURE AND RELATIVE HUMIDITY												AVERAGE RAINFALL FOR DIVISION	REMARKS
	Parrita (Station)			Damas (Station)			(Station)			(Division)				
	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity		
	Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.			
1	91	72	96			89				91	72	93	.69	
2	92	71	96			87				92	71	92	.05	
3	92	73	96			96				92	73	96	.13	
4	90	71	95			91				90	71	93	1.38	
5	91	71	95	85	70	91				91	70	93	1.35	
6	92	71	95	84	67	87				92	67	91	.18	
7	95	75	95	83	68	87				95	68	91	.07	
8	91	72	95	83	69	83				91	69	89	.07	
9	93	70	95	85	68	87				93	68	91	.02	
10	90	71	91	86	69	91				90	69	91	.01	
11	93	70	91	81	72	87				93	70	89	.09	
12	90	70	95	85	69	86				90	69	91	.01	
13	91	71	95	85	72	91				91	71	93	.06	
14	91	72	95	85	69	86				91	69	91	.02	
15	91	72	91	85	69	91				91	69	91	.08	
16	90	70	95	85	70	86				90	70	91	.01	
17	90	72	96	84	70	91				90	70	94	.03	
18	91	72	96	85	72	91				91	72	94	.03	
19	92	70	95	85	69	86				92	69	91	-	
20	92	70	91	85	70	91				92	70	91	1.37	
21	91	69	95	85	72	86				91	69	91	.27	
22	90	72	95	85	74	86				90	72	91	-	
23	91	72	91	85	71	91				91	71	91	.76	
24	90	72	95	85	69	91				90	69	93	1.51	
25	93	68	96	85	70	86				93	68	91	.44	
26	90	72	91	85	69	91				90	69	91	-	
27	92	73	94	85	69	91				92	69	93	.85	
28	88	72	91	85	70	91				88	70	91	2.79	
29	92	73	96	85	74	87				92	73	92	.09	
30	90	72	91	85	73	91				90	72	91	.07	
31	92	76	95	85	70	91				92	70	93	.01	
Month This Year	95	68	94	86	67	89				95	67	92	12.44	
Month Last Year	88	68	91	96	71	96				96	70	94	12.50	
Period This Year	101	64	91	86	53	94				101	55	94	87.18	
Period Last Year	104	65	82	99	67	96				104	65	88	56.69	

REMARKS

Damas temperature gauge was out of order in the first part of month

See Form 1261 for detail of daily rainfall by farms for each district.

*For this particular data, the Division is represented by three typical stations

Quepos, C.R., Nov. 4, 1940 mr/hmd
(Date)

AVERAGE RAINFALL

	1940			1939			1938			1937		
	No. Sta.	M.	P.	No. Sta.	M.	P.	No. Sta	M	P	No. Sta	M	P.
Parrita West	3	13.77	87.55	2	12.39	55.68						
Parrita East	4	12.22	84.58	4	11.58	56.01	1	16.94	115.08	1	19.11	102.07
Damas	2	10.86	91.38	1	16.41	26.99						
TOTAL	9	12.44	87.18	7	12.50	56.69	1	16.94	115.08	1	19.11	102.07

1261 (4-29)

CIA BANANERA DE COSTA RICA COMPANY, QUEPOS OFFICE / DIVISION

FARM RAINFALL REPORT, MONTH OF OCTOBER 19 40.

DATE	Parrita West - 3 Stations: Angeles	Palmar	Leona	Total	Aver.	Parrita East - 4 Stations: Parrita	Barb.	Nicoya	P/Seco	Total	Aver.
1	1 30	1 -	65	2 95	98	1 78	84	25	28	3 15	79
2						02		40	07	49	12
3	30	45	05	80	27	09	03	15	03	50	08
4	1 14	2 -	1 03	4 47	1 49	1 30	1 02	85	1 20	4 37	1 09
5	2 30	1 60	1 40	5 30	1 77	1 68	1 98	80	1 35	6 01	1 50
6	05		20	25	08	13	13	25	22	73	18
7						03	14		08	25	06
8		15	10	25	08	02	13	05	07	27	07
9		-	10	10	03	03				02	01
10							08			06	02
11	30	20	35	55	18	10	04		12	26	07
12							03		03	06	02
13						03		38	13	53	13
14	05			05	03						
15		05	40	45	15	08				09	02
16											
17	05			05	01	06				06	02
18	15			15	05						
19											
20	1 55	1 -	1 -	3 55	1 18	1 60	1 90	1 -	1 55	7 05	1 78
21	15	20	15	50	17	15	09	10		34	09
22											
23	40	1 -	60	2 00	67	68	78	68	98	3 12	78
24	1 30	1 40	1 95	4 65	1 55	2 00	1 21	1 30	1 47	5 98	1 49
25	70	45	35	1 51	50	40	58	20	20	1 38	34
26											
27	1 20	2 50	35	4 05	1 35	1 70	61	50	60	3 41	85
28	4 30	3 90	1 -	9 20	3 07	3 20	2 29	2 40	2 20	10 09	2 52
29		10	30	27	10	10	27			37	09
30			20	20	07	12		05	21	42	10
31								08		08	02
Month This Yr.	15 55	15 -	9 79	41 31	13 77	16 30	12 13	9 48	10 99	48 90	12 22
Month Last Yr.	10 65		14 14	24 77	12 39	10 83	12 54	11 24	11 71	46 31	11 58
Period This Yr.	95 49	85 30	80 93	257 62	87 55	98 53	84 73	77 30	77 81	338 37	84 59
Period Last Yr.	54 60		25 05	79 63	55 69	62 58	48 40	46 38	56 54	214 38	56 01

DATE	Damas - 2 Stations: Pocar.	Quebr.	Total	Aver.	Division 9 Stations: Total	Aver.
1	-	15	15	05	6 25	69
2					49	05
3					1 10	13
4	2 20	1 40	3 60	1 80	12 44	1 38
5	80	15	95	47	12 26	1 38
6	35	25	60	30	1 58	18
7	20	15	35	18	60	07
8	-	10	10	05	52	07
9	05		05	02	17	02
10					06	01
11					21	09
12	05		05	03	11	01
13					53	06
14	10		10	05	15	03
15	10	10	20	10	73	08
16		10	10	05	10	01
17		15	15	08	26	02
18		15	15	07	30	03
19						
20		1 75	1 75	87	12 32	1 37
21	1 20	40	1 60	80	2 44	27
22						
23	80	90	1 70	85	6 83	76
24	1 80	1 15	2 95	1 47	13 58	1 51
25	50	58	1 06	54	5 97	44
26						
27	20		20	10	7 68	85
28	1 80	4 -	5 80	2 90	25 09	2 79
29		10	10	05	77	06
30					62	07
31					05	03
Month This Yr.	10 15	11 58	21 73	10 86	111 94	12 44
Month Last Yr.	16 41		16 41	16 41	87 45	12 50
Period This Yr.	95 44	85 32	181 76	91 36	777 75	87 12
Period Last Yr.	26 99		26 99	26 99	321 09	56 59

USE REVERSE SIDE FOR REMARKS

CORRECT

Quepos, C.R., Nov. [illegible] 1940 [illegible]

(DATE)

1261 (4-29)

Cia. Bananera de Costa Rica COMPANY, QUEPOS { OFFICE / DIVISION

FARM RAINFALL REPORT, MONTH OF October 1940

DATE	Quepos		Punts.		Paquita		Naranjo	
1		-		32				-
2		-		-				-
3	1	81		52				30
4		50		47				95
5		-		42				50
6		03	1	32				-
7		19	1	99				20
8		-		05				20
9		-		-				-
10		-		-				-
11		36		-				18
12		-		-				20
13		05		-				-
14		10		-				-
15		08		-				70
16		03		-				-
17		06		-				-
18		04		-				60
19		10		-				-
20		78		-				09
21		52		-			1	00
22		64		84				10
23		-	1	50				70
24		-	1	30				60
25		-		-				10
26		10		-				-
27	3	90	1	13				25
28		-	1	10			3	05
29		30		-				-
30		-		-				38
31		10		30				65
Month This Yr.	9	62	11	26			10	75
Month Last Yr.	17	34	9	77	6	26	10	78
Period This Yr.	95	49	46	86	4	48	94	27
Period Last Yr.	64	85	37	69	60	58	64	59

USE REVERSE SIDE FOR REMARKS

CORRECT

Quepos, Costa Rica - November 5, 1940
(DATE)

AIR MAIL

Quepos, November 30, 1940

Dr. W. Popenoe
United Fruit Company
Guatemala City, Guatemala

Dear Popenoe:

Block has just returned from Guatemala City, bringing with him some canna bulbs which you were kind enough to let him have. These arrived in quite good condition and are now planted out around my house. I certainly appreciate your kindness in this connection.

It is a long time since you paid us a visit here. Since then both Quepos and Golfito have grown to be quite little towns and our farms are looking quite well. I hope you will have an opportunity of dropping around and looking us over sometime in the near future.

With kindest personal regards to both Mrs. Popenoe and yourself and again many thanks.

Very truly yours,

N. E. SANDERSON

1262 (3-31)

CIA BANANERA DE COSTA RICA COMPANY, GOLFITO DIVISION {OFFICE / DIVISION

METEOROLOGICAL REPORT, MONTH OF March 1941 19

DATE	*TEMPERATURE AND RELATIVE HUMIDITY												AVERAGE RAINFALL FOR DIVISION	REMARKS
	POZO (Station)			(Station)			(Station)			(Division)				
	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity		
	Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.			
1	91	75	83											
2	91	74	79										.02	
3	92	76	81											
4	92	75	87										.04	
5	93	76	87										.02	
6	92	77	89										.20	
7	92	78	85										.52	
8	91	76	79										.19	
9	95	76	91										.13	
10	90	75	87										.07	
11	92	73	78										.13	
12	93	73	88											
13	92	70	91										.01	
14	90	71	76											
15	90	74	75											
16	91	77	87											
17	92	76	87											
18	91	76	87											
19	91	76	87											
20	93	76	83											
21	94	77	83											
22	93	77	76											
23	94	79	87										.01	
24	94	78	83											
25	94	77	87										.18	
26	92	77	79										.04	
27	94	78	79											
28	94	78	87										.04	
29	92	76	85										.26	
30	90	78	83										.35	
31	92	77	87										.05	
Month This Year	94	70	84										2.20	
Month Last Year				x									4.87	
Period This Year	94	70	88										7.34	
Period Last Year				x									8.67	

REMARKS

x No figures for last year available. Thermometer and Hydrometer out of order.

See Form 1261 for detail of daily rainfall by farms for each district.
*For this particular data, the Division is represented by three typical stations

Golfito, April 14, 1941
WF/lv (Date)

	1941			1940			1939			1938			1937	
	Stations	Month	Period	Stations	Month	Period	Stations	Month	Period	Stations	Month	Period	Stations	Month	Period
Golfito	2	3.92	11.06	2	3.55	11.19	1	1.60	2.90	1	5.80	11.88	1	1.91	15.26
Kilo. 33	6	3.55	11.57	4	7.07	7.07									
Pozo	8	.94	2.35	3	3.08	4.39	1	.37	1.77	1	5.92	11.26	1	7.32	18.63
Sierpe	1	1.06	4.85	1	1.62	3.66									
Coto	5	2.13	8.46	1	4.24	7.37	1	7.09	8.50	1		3.83	1	1.13	8.40
Total	22	2.20	7.34	11	4.57	8.67	3	3.02	4.39	3	3.91	8.99	3	3.43	14.09

1187 (8-40)

CIA. BANANERA DE COSTA RICA COMPANY, GOLFITO DIVISION 19

FARM REPORT FOR PERIOD ENDED March, 1941 PRODUCT BANANOS

FARMS	ACREAGE		△ EXPENDITURE		PRODUCTION			COUNT RATIO	COST PER COUNT			COST PER ACRE MTCE. ONLY
	* IRRIGATED	IN BEARING	Farm Maintenance and Disease and Insect Control	HARVESTING	STEMS	COUNTS	† COUNTS PER ACRE		Farm Mtce.	Harvesting	⊙Farm Deprn.	
					13 WEEKS							
Farm 3		261	5728	844	3829	3799	14.56	.9921	.508	.222	.347	21.95
		154	6830	710	3083	3072	11.39	.9964	.283	.231	.198	85.30
Farm 5		-	158	24	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-
Farm 9		276	5855	707	3282	3257	11.80	.9921	.699	.217	.267	20.05
		377	7757	782	7081	6029	16.00	.9801	.125	.114	.100	12.00
Farm 16		12	329	4	-	-	-	-	-	-	-	27.42
		-	-	-	-	-	-	-	-	-	-	-
Farm 17		142	2768	-	-	-	-	-	-	-	-	19.49
		-	211	34	384	343	-	.920	.616	.100	-	-
Pozo Norte		125	664	44	-	-	-	-	-	-	-	5.27
		126	665	394	4899	4951	53.24	.966	.208	.093	.619	6.86
Pozo General		-	4650	28	-	-	-	-	-	-	-	-
		-	4617	-	-	-	-	-	-	-	-	-
Golfito Period		817	19832	1651	7111	7056	6.64	.9922	.611	.234	.523	24.27
		657	20260	1920	14857	14545	17.61	.9791	.393	.132	.124	84.88

Golfito, April 12, 1941
DATE
AJV/lv

*Average under irrigation included in "In Bearing" figures.
†Counts, Pounds, etc.
Use two lines for each farm. Show last year's figures in red.
△Report even dollars only eliminating cents.
⊙Farm Depreciation (Include Irrigation and Disease Control)

1187 (8-40)

CIA. BANANERA DE COSTA RICA COMPANY, GOLFITO DIVISION

FARM REPORT FOR PERIOD ENDED OCTOBER 1941 PRODUCT BANANAS

FARMS	ACREAGE		△ EXPENDITURE		PRODUCTION			COUNT RATIO	COST PER COUNT			COST PER ACRE MTCE. ONLY
	* IRRIGATED	IN BEARING	Farm Maintenance and Disease and Insect Control	HARVESTING	Stems	Counts	Counts PER ACRE		Farm Mtce.	Harvest-ing	⊙Farm Deprn.	
Farm 3		234	19960	2515	14660	14525	62.07	.991	1.374	.173	.655	85.30
		266	28907	2711	12864	13256	59.61	.973	1.575	.143	.110	108.67
" 4		28	1070	-	-	-	-					38.21
" 5		-	543	24	-	-	-	-	-	-		-
		74	3591									49.19
" 8		-	607	-	-	-	-	-	-	-		
" 9		-	11	-	-	-	-	-	-	-		
		322	22268	1731	16170	15788	49.03	.976	1.412	.110	[illegible]	69.22
" 10		105	7168	580	4130	4107	39.11	.994	1.745	.141	.023	68.27
" 11		168	14526	1329	8190	8144	48.46	.994	1.784	.163	.477	86.46
" 16		-	-	-	-	-	-	-	-	-	-	
		8	3694									461.75
" 17		155	11952	895	5204	5010	32.32	.963	2.386	.179	.736	77.11
		92	1064	124	354	343	3.46	.969	3.102	.362	-	10.73
Pozo Norte		126	2265	354	1563	1318	10.46	.843	1.719	.269	.715	17.98
		136	3352	572	4723	4572	35.29	.968	.733	.125	.153	25.60
Pozo General		-	18079	667	-	-	-	-	-	-	-	-
			17481									
Golfito Period		816	76181	6364	33747	33104	40.57	.981	2.301	.192	.768	93.36
		895	80377	5133	40111	39059	43.69	.974	2.058	.138	.153	89.81
Golfito Month		819	9610	864	6610	6365	7.77	.963	1.510	.136	.544	11.73
		820	8804	931	6911	6613	7.94	.943	1.331	.142	.085	10.74

Golfito, Costa Rica Nov. 8 1941
DATE

*Average under irrigation included in "In Bearing" figures.
†Counts, Pounds, etc.
Use two lines for each farm. Show last year's figures in red.
△Report even dollars only eliminating cents.
⊙Farm Depreciation (Include Irrigation and Disease Control)

1262 (3-31)

CIA. BANANERA DE COSTA RICA COMPANY, GOLFITO {OFFICE / DIVISION

METEOROLOGICAL REPORT, MONTH OF OCTOBER 19[illegible]

DATE	*TEMPERATURE AND RELATIVE HUMIDITY												AVERAGE RAINFALL FOR DIVISION	REMARKS
	P.O.S. (Station)			(Station)			(Station)			(Division)				
	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity		
	Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.			
1	89	74											1.44	
2	89	74											.11	
3	88	74											.37	
4	88	74											.09	
5	89	77											.13	
6	89	77											.01	
7	87	74											.11	
8	88	74											.01	
9	87	74											.27	
10	88	76											.42	
11	92	76											.23	
12	89	74											.47	
13	90	75											.7	
14	91	76											.21	
15	88	76											.44	
16	88	74											.10	
17	89	74											.05	
18	89	75											.03	
19	88	76											.54	
20	86	74											.11	
21	88	76											.13	
22	89	75											.35	
23	88	74											.05	
24	88	74											.17	
25	89	74											.27	
26	89	74											.50	
27	88	74											.89	
28	88	74											.96	
29	87	74											.57	
30	87	75											1.10	
31	87	75											1.50	
Month This Year	92	74											11.87	
Month Last Year	92	69											24.05	
Period This Year	94	70											110.14	
Period Last Year	95	65											102.69	

REMARKS

See Form 1261 for detail of daily rainfall by farms for each district.
* For this particular data, the Division is represented by three typical stations

Golfito, Costa Rica - Nov. 8, 1941
V.Mac (Date)

AVERAGE - RAINFALL

DISTRICT	1941			1940			1939			1938			1937		
	Sta.	Mo.	Per.	Sta.	Mo.	Per	Sta.	Mo.	Per	Sta.	Mo.	Per	Sta.	Mo.	Per
Golfito	1	16.10	136.03	1	18.94	146.19	1	27.05	90.49	1	33.20	126.09	1	21.43	105.65
Pto.Jimenez	1	10.02	75.89	1	26.42	110.85	1	24.68	91.68	-	-	-	-	-	
Coto	1	18.01	86.39	1	29.27	87.28	1	12.57	74.70	1	21.08	78.19	1	17.81	121.22
Pozo	9	9.44	113.33	9	23.74	94.96	3	14.60	102.41	1	35.90	144.95	1	32.11	170.41
TOTAL	12	11.67	110.14	12	24.05	102.68	6	18.02	98.23	3	30.06	116.41	3	23.78	129.

CIA BANANERA DE COSTA RICA COMPANY, QUEPOS { OFFICE / DIVISION

1261 (4-29)

FARM RAINFALL REPORT, MONTH OF OCTOBER 1941

NON PRODUCING AREAS

DATE	Quepos	Fonts.	Naranjo
1	44		35
2	59	10	90
3	12	20	05
4			
5			30
6	29		
7		10	
8			
9	2 09	15	
10			
11			
12	1 03		55
13	73		1 04
14	75		1 54
15	02		
16		25	25
17			
18			
19			
20	05		42
21	1 30		
22	75		
23			70
24	04		
25			
26	1 96	1 30	15
27	1 00		
28		10	70
29	3 10	60	
30	1 40	10	4 00
31	07	15	1 10
Month This Yr.	[illegible]	5 65	12 56
Month Last Yr.	9 02	11 58	10 15
Period This Yr.	93 47	54 56	96 50
Period Last Yr.	96 19	46 86	94 27

USE REVERSE SIDE FOR REMARKS

CORRECT

Quepos, C.R. Nov. 18, 1941 - HRP/ahm
(DATE)

1187 (8-40)

CIA BANANERA DE COSTA RICA COMPANY, QUEPOS DIVISION

FARM REPORT FOR PERIOD ENDED FEBRUARY 1942 PRODUCT BANANAS

FARMS	ACREAGE		△ EXPENDITURE		PRODUCTION			COUNT RATIO	COST PER COUNT			COST PER ACRE MTCE. ONLY
	* IRRIGATED	IN BEARING	Farm Maintenance and Disease and Insect Control	HARVESTING	Stems	Counts	Counts † PER ACRE		Farm Mtce.	Harvesting	⊙Farm Deprn.	
Parrita East												
Parrita	766	780	11869	349	3835	3807	4.88	.993	3.117	.092	1.997	15.22
	734	765	106[illegible]	2740	44015	43664	57.[illegible]	[illegible]	[illegible]	[illegible]	.095	[illegible]
Barbural	539	539	6214	435	7063	6993	12.97	.990	.889	.062	1.648	11.53
	[illegible]	[illegible]	9063	17[illegible]	[illegible]	34508	41.[illegible]	.97[illegible]	[illegible]	[illegible]	[illegible]	11.01
Nicoya	701	701	11935	711	10691	10564	15.07	.988	1.130	.067	.851	17.03
	773	773	[illegible]	1915	[illegible]	[illegible]7744	[illegible]	.977	[illegible]	[illegible]	.137	[illegible]
Cacao	870	870	14870	357	6628	6548	7.53	.988	2.271	.055	.922	17.09
	876	879	10728	[illegible]	5236[illegible]	51331	5[illegible].40	.980	[illegible]	.047	.20[illegible]	[illegible]
Palo Seco	965	965	14638	936	13837	13764	14.26	.995	1.063	.068	.883	15.17
	104[illegible]	1042	139[illegible]	[illegible]	6021[illegible]	59129	[illegible]	.98[illegible]	[illegible]	.050	.11[illegible]	[illegible]
Superintendence			3800	262								
			4839	34								
Total Month	3674	3674	34302	1564	25795	25552	6.95	.991	1.342	.061	.925	9.34
	4248	4280	[illegible]	6764	12[illegible]	122[illegible]	[illegible]	.98[illegible]	.280	.055	.11[illegible]	[illegible]
Total Period	3841	3855	63326	3050	42054	41676	10.81	.991	1.519	.073	1.134	16.4[illegible]
	[illegible]	4280	58769	11748	[illegible]	226374	5[illegible].69	[illegible]	.260	[illegible]	[illegible]	[illegible]
Parrita West												
California	872	872	17137	685	12475	12359	14.17	.991	1.387	.055	.451	19.65
	501	501	6135	3227	73161	68528	1[illegible].78	.936	.090	.047	[illegible]	[illegible]
Los Angeles	601	601	14074	61								23.42
	672	673	8991	2618	54360	52761	78.40	.970	.170	.050	.108	13.[illegible]
La Palma	951	951	17149	988	17036	16823	17.69	.987	1.019	.059	.370	18.03
	218	217	1947	1523	37080	33197	152.[illegible]	.895	.03[illegible]	.046	[illegible]	[illegible].97
El Tigre	1031	1031	17931	190	1677	1654	16.04	.986	10.841	[illegible]	.097	17.39
	200	200	2121	1694	35426	32703	1[illegible]	[illegible]	.065	.052	.0[illegible]	10.61
La Leona	786	834	13677	654	9437	9200	11.03	.975	1.487	.071	.759	16.40
	394	395	7100	2206	3517[illegible]	34441	[illegible].19	.979	[illegible]	[illegible]	[illegible]	[illegible]
Superintendence			4496	279								
			2790	41								
Total Month	4135	4176	47467	1586	24701	24358	5.83	.986	1.94[illegible]	.065	[illegible]	11.37
	[illegible]172	[illegible]172	19573	7193	140443	130704	[illegible].18	[illegible]	.150	.055	.060	[illegible].01
Total Period	4241	4289	84464	2877	40625	40036	9.33	.986	2.110	.072	.828	19.69
	1986	1986	[illegible]	11309	239240	221630	111.50	[illegible]	.1[illegible]1	.061	[illegible]	[illegible]
Damas												
Los Rios		45	25	19	364	347	7.71	.953	.072	.055	.078	.56
			163	155	32[illegible]	2891		.881	.05[illegible]	.067		
Pocares	670	744	13094	736	14399	14214	19.10	.987	.921	.052	.530	17.60
	[illegible]05	[illegible]05	[illegible]	1089	24338	21251	10[illegible].66	.873	.115	.061	[illegible]	11.[illegible]
Trinidad	446	446	8570	533	7335	7094	15.91	.967	1.208	.075	.651	19.22
		42	[illegible]53	[illegible]	5644	4399	104.74	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Valeria	705	704	13765	788	13166	13024	[illegible]	.989	1.057	.061	.592	19.55
	50	50	[illegible]	747	13745	12241	[illegible]	[illegible]91	[illegible]	[illegible]	[illegible]	[illegible]
Quebrada	[illegible]	597	11495	1094	10578	10427	17.47	.985	1.102	.105	.592	19.25
Cerros	137	137	3611	285	3986	3811	27.82	.956	.948	.075	1.521	26.36
Superintendence			4091	229								
			101	2								
Total Month	2501	2595	28029	1997	30376	29899	11.52	.984	.964	.067	.596	11.11
	[illegible]	340	[illegible]636	1730	[illegible]	[illegible]9791	87.6[illegible]	.870	.1[illegible]	[illegible]	[illegible]	10.[illegible]
Total Period	2555	2673	54651	3684	[illegible]	48917	18.30	.98[illegible]	1.117	.075	.781	20.4[illegible]
	[illegible]	[illegible]97	4095	[illegible]	27[illegible]	[illegible]	1[illegible]	[illegible]	.100	.050	.10[illegible]	[illegible]
Grand Total Month	10310	10445	110598	[illegible]147	80872	79809	7.64	.987	1.386	.064	.728	10.[illegible]
	[illegible]	6792	57440	15686	[illegible]	282760	41.6[illegible]	[illegible]	[illegible]	.056	[illegible]	[illegible]
Grand Total Period	10637	10817	[illegible]02441	9611	132507	130629	12.08	.988	1.550	.073	.88[illegible]	[illegible]
	[illegible]	[illegible]	61949	2535[illegible]	[illegible]	4[illegible]8788	74.[illegible]	.946	.1[illegible]	.05[illegible]	[illegible]	[illegible].01

Quepos, March 5, 1942 — rmc/mrs
DATE

*Average under irrigation included in "In Bearing" figures.
†Counts, Pounds, etc.
Use two lines for each farm. Show last year's figures in red.
△Report even dollars only eliminating cents.
⊙Farm Depreciation (Include Irrigation and Disease Control)

1262 (3-31)

COMPANY, [illegible] OFFICE DIVISION

METEOROLOGICAL REPORT, MONTH OF [illegible] 19[illegible]

DATE	*TEMPERATURE AND RELATIVE HUMIDITY												AVERAGE RAINFALL FOR DIVISION	REMARKS
	(Station)			(Station)			(Station)			(Division)				
	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity		
	Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.			
1	90	70					87							
2	90	70					87							
3	90	70					89							
4	90	68					90							
5	90	70					90							
6	91	69					91							
7	90	70					90							
8	90	70					89							
9	90	70					89							
10	90	69					88							
11	91	72					88						.04	
12	90	70					88							
13	90	69					88							
14	90	70					88							
15	90	68					90							
16	90	68					90							
17	90	70					88						.04	
18	90	70					88							
19	89	70					89							
20	90	68					89							
21	89	68					89							
22	89	68					89							
23	88	68					89							
24	85	69					89							
25	85	69					88							
26	86	69					89							
27	84	69					86							
28	88	70					89							
29														
30														
31														
Month This Year	91	68					90						.08	
Month Last Year	97	68					88	78					.64	
Period This Year	91	68					88	68					.29	
Period Last Year	97	65					88	65					1.28	

REMARKS

Dunns thermometer for minimum temperature reported broken 2/15/42

See Form 1261 for detail of daily rainfall by farms for each district.

* For this particular data, the Division is represented by three typical stations

[illegible], C. R., March 6, 1942 - arm/rro

(Date)

	1942			1941			1940			1939		
	No. Sta.	M	P	No. Sta.	M	P	No. Sta.	M	P	No. Sta.	M	P
Ferrits West	3	.04	.04	3	.03	.53	2		.16	1	.16	1.05
Ferrits East	4	.01	.03	4	.31	.75	4	.02	.33	2		.95
Dunns	3	.21	.85	2	1.78	3.35	1		1.00			
	10	.08	.10	9	.54	1.25	7	.01	.37	3	.05	.98

1261 (4-29)

CIA BANANERA DE COSTA RICA COMPANY, QUEPOS { OFFICE / DIVISION

FARM RAINFALL REPORT, MONTH OF FEBRUARY 19 42

DATE	Parrita W.-3Stations					Parrita E - 4 Stations						Damas - 3 Stations					
	Laveles	Palma	Leona	Total	Aver.	Parrita	Barb.	P.Seco	Nicoya	Total	Aver.	Pocares	Q.B.	Cerros	Total	Aver.	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11	05	07		12	04	03	01			04	01		06	19	25	08	
12																	
13																	
14																	
15																	
16																	
17													11	28	39	13	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
Month This Yr.	05	07		12	04	03	01			04	01		17	47	64	21	
Month Last Yr.			10	10	03	27	37	16	20	1 00	22	2 20	1 33		3 53	1 18	
Period This Yr.	05	07		12	04	03			06	12	03		21	59	80	26	
Period Last Yr.		1 40	20	1 60	53	32	1 19	1 18	29	2 98	75	3 20	3 50		6 70	3 35	

USE REVERSE SIDE FOR REMARKS

CORRECT

Quepos, Costa Rica-March 7, 1942 - wg/mra

(Date)

1261 (4-20)

CIA BANANERA DE COSTA RICA COMPANY, QUEPOS OFFICE / DIVISION

FARM RAINFALL REPORT, MONTH OF FEBRUARY 19 42

DATE	10 Stations Total	10 Stations Aver.	Non-Producing Areas Quepos	Non-Producing Areas Punta Mar.
1				
2				
3				
4				
5				
6				
7				10
8				
9				
10				
11	31	04	34	05
12				
13				
14				
15				
16				
17	39	04		
18				
19				
20				
21				
22				
23				
24				
25				
26			22	
27				30
28				
29				
30				
31				
Month This Yr.	80	08	56	46
Month Last Yr.	4 97	34	2 10	3 05
Period This Yr.	1 24	10	56	46
Period Last Yr.	11 26	1 23	2 76	10 3 25

USE REVERSE SIDE FOR REMARKS

CORRECT

Quepos, Costa Rica-March 7, 1942 - wg/mrs
(Date)

1262 (3-31)

COMPANIA BANANERA DE COSTA RICA COMPANY, EAST COAST 47 OFFICE DIVISION

METEOROLOGICAL REPORT, MONTH OF FEBRUARY 1942

DATE	*TEMPERATURE AND RELATIVE HUMIDITY												AVERAGE RAINFALL FOR DIVISION	REMARKS
	(Station) SIQUIRES DIST.			(Station)			(Station)			(Division)				
	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity	TEMPERATURE		Relative Humidity		
	Max.	Min.		Max.	Min.		Max.	Min.		Max.	Min.			
1				82	69								.71	
2				88	70								1.88	
3				78	69								1.19	
4				81	70								.30	
5				82	71								.21	
6				84	72								.17	
7				84	71								.03	
8				83	72								.20	
9				86	73								.03	
10				83	71									
11				86	70									
12				86	71									
13				85	71								.14	
14				86	70								.24	
15				86	73								.33	
16				84	75								1.00	
17				82	75								.86	
18				86	73									
19				85	71								.26	
20				87	72									
21				86	72								.01	
22				87	74									
23				86	71								.01	
24				88	72									
25				86	74								.47	
26				85	73								.13	
27				85	75									
28				84	73									
29														
30														
31														
Month This Year				88	69								7.41	
Month Last Year				89	70								9.52	
Period This Year				88	69								18.13	
Period Last Year				89	70								18.39	

REMARKS

See Form 1261 for detail of daily rainfall by farms for each district.
*For this particular data, the Division is represented by three typical stations

Limon, C.R. - March 3, 1942

AVERAGE RAINFALL - FEBRUARY 1942

DISTRICT	Nº Stations	1942 Month	1942 Period	1941 Month	1941 Period	1940 Month	1940 Period	1939 Month	1939 Period	1938 Month	1938 Period
Limon	2	6.67	18.40	8.96	14.78	16.35	27.48	3.46	5.94	12.18	36.56
Zent	2	9.60	22.77	10.61	20.57	24.63	37.86	2.93	4.54	13.73	38.90
Siquirres	2	7.27	17.28	12.05	21.88	23.58	39.91	1.94	4.89	10.16	31.28
Peralta	1	4.75	10.04	6.45	16.32	12.78	23.66	.57	1.99	7.98	25.63
Division)											
Verage)		7.41	18.13	9.52	18.39	19.34	32.23	2.22	4.34	11.01	33.09

(Date) 10/ez.

1261 (4-29)

CIA BANANERA DE COSTA RICA COMPANY, EAST COAST { OFFICE / DIVISION

FARM RAINFALL REPORT, MONTH OF FEBRUARY 1942.

LIMON		ZENT				SIQUIRRES		PERALTA		TOTAL		AVERAGE	
LIMON	PENSHURST	ZENT	M. VERDE	SIQ.	GUACIMO	"		"		"		"	
40	1 25	92	29	1 00	62	47		4 95		71			
2 70	65	3 35	1 10	1 40	2 35	1 31		12 76		1 82			
1 00		1 25	3 26	1 00	68	1 16		8 34		1 19			
36	15	27	22	38	50	22		2 09		30			
1 15		18	02			15		1 47		21			
43		05	15	20	08	25		1 16		17			
		18	06					20		03			
	10	46	36	18	15	12		1 36		20			
						24		24		03			
33		18	31	16	05			98		14			
99		14	11	15	30			1 68		24			
81	60	10	09					1 60		23			
65	10	2 70	58	50	2 20	51		6 95		1 00			
09	20	44	22	18	55	20		1 84		26			
		28	41	73		42		1 81		26			
		10						10		01			
			05					05		01			
59	55	90	38	67	10			3 29		47			
06	13	22	10	20	20			91		13			
6 51	4 83	11 58	7 68	6 72	7 78	4 75		51 82		7 41			
13 88	4 64	11 81	9 40	11 74	12 37	8 42	4 48	76 14		9 52			
21 47	15 33	22 96	22 58	17 03	17 51	10 04		126 92		18 13			
21 11	8 48	21 63	19 48	22 80	20 94	21 01	11 65	147 08		18 39			

USE REVERSE SIDE FOR REMARKS

CORRECT

con. C.R. - March 3, 1942 - fc/ez.

(DATE)