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I. O. - 36
7221

A. I. C. — INSTITUTO DE PESQUISAS AGRONÔMICAS — PERNAMBUCO - Caixa Postal 1.022

Dr. DAVID ROGERS
The New York Botanical Garden
Bronx Park - New York 58 - U.S.A.

I acknowledge your letter from July 7, 1961 and thank very much the "maniçoba" rubber determinations and your very apropriate. comments.

Sarmento showed me the letter you sent him and he is very hopeful in getting the assistensionship in Texas or in another place recomended by you. He is studying English very hardly and, I think, he has already mailed the material you asked him.

I talked to Dr. Haynes on the possible help from the I C A and I trust that some suitable arrangement will be made.

Dárdano de Andrade Lima will be back, very soon, in our staff and I hope to count also with you for helping us in a better avaliation on the possibilities and some new research on Manihot.

I am sending the best regards to your family, and assure to be very agreable to hear from you.

Sincerely yours

MÁRIO COELHO
Diretor Geral

July 7, 1961

Dr. Mario Coelho
Instituto Agronomico do Nordeste
Recife, Pernambuco, Brazil

Dear Mario:

Through the courtesy of the U. S. Rubber Company and Dr. C. E. Rhines of the Plantation Division of that organization, we have received a good analysis of the crude rubber specimen and the rubber ball that Dardano gave me.

As you can see, the rubber content of the manicoba is more or less equivalent to that of Hevea rubber. The percentage of ash and nitrogen is of course higher in the manicoba samples, but not sufficiently so to be of particular concern. It would seem to me, therefore, that as far as the rubber quality of the manicoba is concerned it would be useful to examine more critically rubber productivity from this source. As you know, the plants of manicoba are quite variable and it is very likely that there is a considerable variability in the percentage of non-rubber materials in the latex from these plants.

It would seem profitable therefore that we begin some sort of investigation in terms of the kinds of varieties to be found not only in Pernambuco but in other states of the northeast in order to select varieties whose non-rubber contents of the latex might be lower than that given in the sample analysis. Perhaps simultaneously with this type of endeavor one might consider a program of optimum cultivation of these plants both in terms of areas and in terms of periods of extraction of the rubber. In the event that you see fit to examine this possibility, I shall be glad to hear from you and perhaps to suggest means by which funds for such research could be made available.

I have been trying to find means by which Alberto Sarmento could come to the U. S. and study and have sent a copy of one letter to him to you to keep you informed of the progress in this respect. I have suggested to Sarmento that the most useful training for him in his specialty (forage grasses for the State of Pernambuco) would be to work under the direction of Dr. Frank Gould of Texas A & M, a specialist in the Texas grasses. Dr. Gould has indicated to me

in a letter that he would be willing to accept Sarmento and that it is now up to Sarmento to make applications to Dr. Gould for graduate work there in College Station, Texas. I have further written to Sarmento suggesting that he apply not only to the U. S. Depa rtment of State for assistance but that he also write to the Organization of American States in Washington where he may also be able to get an assistantship. I trust that some suitable arrangement may be made in his behalf.

I look forward to hearing from you on the manicoba problem.

Sincerely yours

David J. Rogers
Curator of Economic Botany

DJR:MDF
Enclosure

July 6, 1961

Dr. C. E. Rhines
United States Rubber Company
Research Center
Wayne, New Jersey:

Dear Dr. Rhines:

I am very pleased to have received the analysis of Manihot rubber samples. These are extremely useful and give us some hope that we can make some progress with the production of a more useful rubber from Manihot.

Sincerely yours

David J. Rogers
Curator of Economic Botany

DJR:MLF

United States Rubber Company
Plantation Division
Research Center
Wayne, New Jersey

Telephone
OXbow 4-4000

Research & Development
Department

June 20, 1961

Dr. David J. Rogers
The New York Botanical Garden
Bronx Park
New York 58, New York

Dear Dr. Rogers:

Analyses of the Manihot rubber samples have been completed and are being forwarded to you. Your letter indicated that you were sending two lump samples, but only one sample came into my hands. It is possible that the two samples may have been combined.

There is no question that the major hydrocarbon in the Manihot sample is identical with Hevea hydrocarbon. You will note, however, that the Manihot samples contain considerably more non-rubber constituents than the usual Hevea product. This would demand a discount in value in comparison with Hevea. Analyses fairly well account for all the constituents in the lump sample. The nitrogen values have to be multiplied by approximately six to convert to protein. There is a considerable fraction of unknown material in the ball rubber.

The odor of the lump sample as we received it would make it unsuitable for many uses. This odor probably could be eliminated if some control of production could be established.

I hope you find this information of value.

Very truly yours,

C. E. Rhines

C. E. Rhines

CER:mek

Enclosures

Analyses of Manihot Rubber Samples

	% Rubber Hydrocarbon	% Nitrogen	% Ash	% Acetone Extract
Lump	84.48	1.48	3.98	4.75
	84.86	1.43	3.77	
Ball	70.76	0.58	4.82	4.86
	70.35	0.63	4.99	

Typical Natural Rubber Analysis

	% Rubber Hydrocarbon	% Nitrogen	% Ash	% Acetone Extract
Smoked sheet	93	0.45	0.38	2.9

X-ray patterns of lump and ball appeared the same as Hevea rubber. Infrared patterns are very close to the Hevea pattern. There appears to be more alcohol groups in the Manihot than in Hevea; oxidation could account for this difference.

SPECTRUM NO. 2358
SAMPLE Pale crepe
ORIGIN Job # 5-12-8
PURITY
PHASE Solid film
THICKNESS
1.
2.
3.
DATE 5-19-61
OPERATOR JW
REMARKS

INTERCHANGE grating
SLIT PROGRAM 963
GAIN 3.8
ATTENUATOR SPEED 11.0
SCAN TIME 16
SUPPRESSION 6
SCALE
SOURCE CURRENT .3

MISSOURI BOTANICAL GARDEN
"SHAW'S GARDEN"
2315 TOWER GROVE AVENUE
ST. LOUIS 10, MISSOURI
PROSPECT 6-5567

May 23, 1961

Dr. David J. Rogers
Curator of Economic Botany
The New York Botanical Garden
Bronx Park, New York 58, N.Y.

Dear Dave :

It was good to hear from you. I must say we are doing very nicely with the Climatron and already have over 500 different kinds of plants growing in it. Some of these we are eventually going to discard when the rarer kinds come in or become large enough to plant. Everything is growing nicely. You should come and visit with us. You'd be amazed what results we are getting after only 7 months. Getting quite a bit of publicity all over the country and abroad.

I'm anxious to get all the principal economic plants in the Climatron, that is why I asked about the Ceara Rubber. I don't think Chapman Field has it as I was there last May and again last January and pretty well looked over their collection. May write to Dr. Gaskins and find out if he may have some on hand. Perhaps I'll try Fairchild Tropical Gardens. I was glad to get two nice 11' trees of Hevea from Dr. Rhines. I have a small Castilloa elastica and so would like the Manihot to go with it.

I was in Colombia on a plant hunting trip in December and January. Saw many beautiful things and got a lot of nice kodachromes. I consider the Climatron my 'baby' and therefore spend a good deal of my time in it.

Very sincerely,

Lad Cutak

Ladislaus Cutak
Greenhouse Superintendent

May 19, 1961

Mr. Lad Cutak
Missouri Botanical Garden
2315 Tower Grove Avenue
St. Louis 10, Missouri

Dear Lad:

Recently I spoke to Dr. C. E. Rhines of the U. S. Rubber Company who told me that they had sent you Hevea plants and that you were also looking for Manihot Glaziovii.

I told him I would write you to say that they (U. S. Rubber) have no plants of M. Glaziovii but that I would suggest that you contact either the Fairchild Gardens or perhaps the U. S. Introduction Station in Miami where I think I have seen M. Glaziovii growing. I am sure that it would grow quite readily from cuttings off the mature wood, preferably the upper younger stems.

If you don't make any contact in Miami, I know that I have seen the plants growing at the Hope Botanical Gardens in Kingston, Jamaica, and I feel sure that you could get cuttings from them, if not small rooted plants.

How are things going at Missouri? It's been a long time since I have heard any direct word about your activities and those of the Geodesic Dome. It sounds like a fascinating place.

Sincerely

David J. Rogers
Curator of Economic Botany

DJR:MDF

April 28, 1961

Mr. K. Jewers
Tropical Products Institute
50/62 Gray's Inn Road
London, W.C. 1, England

Dear Mr. Jewers:

We have received your informative letter of April 25 on latex from Manihot Glaziovii. I appreciate the effort and time required for this information which will be very helpful in my work.

Sincerely yours

David J. Rogers
Curator of Economic Botany

DJR:MDF

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Director: R.A.E. GALLEY, Ph.D., A.R.C.S., D.I.C., F.R.I.C.
E.S. Hiscocks, M.Sc., F.R.I.C.

Our ref.:
Your ref.:

DSIR

TROPICAL PRODUCTS INSTITUTE,
56/62 Gray's Inn Road,
London, W.C.1.
Tel.: Chancery 5412.

25th April, 1961.

Latex from Manaihot glaziovu.

Dear Dr. Rogers,

I refer to your recent discussion with our Dr. Spensley, during his visit to New York, concerning the latex from Manaihot glaziovu.

Manaihot glaziovu is a fast growing tree which can be tapped after 2 years to give a yield of 4 oz. to 16 oz. dry rubber per tree per annum. Like Hevea braziliensis, some trees yield much more than others, and single trees in East Africa have been reported to yield as much as 10 lb. per annum (G. Martin, India-Rubber Journal, 1943, 105, 10). However, these yields are very poor when compared with Hevea, which averages about 5 lb. per tree per annum, and in some cases exceeds 20 lb. per annum.

The method of collection of the latex from Manaihot glaziovu varies according to the location of the plantation. Thus, in some areas it is possible to collect the latex in a similar manner to Hevea latex, whereas in others, the high viscosity of the latex necessitates its coagulation on the tree with the aid of coagulants. A description of the collection and commercial preparation of Ceara rubber by the latter technique is given by H. Marsland, Tanganyika Territory, Department of Agriculture, Pamphlet No.33. A sample of latex from Manaihot glaziovu has been found to contain 18.3 per cent rubber (A.L. Griffith and K.L. Buchiraya, Indian Forester, 1943, 69, 305). On coagulation, the latex yields a material which on drying contains rubber, resin, and protein. The composition of the coagulum varies according to the source of the latex, and is reported to vary between the following limits (E. Conforti, L'Agricoltura Coloniale, 1934, 28, 475).

Rubber from 70 per cent (East Africa) to 93 per cent (Ceylon)
Resin from 3.1 per cent (Ceylon) to 10.1 per cent (East Africa)
Protein from 0.8 per cent (Uganda) to 4.0 per cent (East Africa).

Ceara rubber is a good quality rubber with properties similar to those of Hevea. It possesses, however, higher viscosity, ash content (0.16 per cent) and resin content, and a lower tensile strength than Hevea rubber. (O.de Vries and W. Spoon, Arch.voor de Rubbercultuur, 1928, 12, 20).

The poor yields of Manaihot glaziovu has resulted in its replacement as a rubber producing tree by Hevea braziliensis.

I trust that the above information covers the various points you raised with Dr. Spensley, but should you require any further information please do not hesitate to ask.

Yours sincerely,

K Jewers.

K. Jewers.

Dr. D. Rogers,
New York Botanic Gardens,
Bronx Park,
New York, 58,
U.S.A.

April 27, 1961

Dr. Hans Ph. Huffnagel
FAO Agricultural Economist
Caixa Postal 298
Belem, Para, Brasil

Dear Hans:

Please excuse me for not acknowledging your letter of the 12th of April with the fine information on Manicoba. I shall be examining information concerning Manihot rubber in more detail shortly. I do not find any particular enthusiasm for studies of these plants by the U. S. Rubber Company. However, it may be well worth pursuing anyway.

Sincerely yours

David J. Rogers
Curator of Economic Botany

DJR:MDF

ORGANIZAÇÃO DE ALIMENTAÇÃO E AGRICULTURA DAS NAÇÕES UNIDAS

FIAT PANIS

TELEG.: FOODAGRI - BELÉM
TELEFONE — 2277

MISSÃO DE ASSISTÊNCIA TÉCNICA JUNTO
À SUPERINTENDÊNCIA DO PLANO DE VALORIZAÇÃO
ECONÔMICA DA AMAZÔNIA

CAIXA POSTAL, 295
BELÉM, PARÁ,
BRASIL

T2/1 - 9844

12 ABR 1961

Dear David,

As promised, I am sending you herewith some more notes on the Maniçoba. I hope it will be of any use to you.

To my great pleasure I received Vol. 14 no. 3 of the Economic Botany today. As expected, Townsend had sent you his mimeograph of November 1958. It appeared in Portuguese text in the "Boletim da Inspetoria Regional de Fomento Agrícola no Estado do Pará" of 1958 (very small local circulation) and rather recently in the "Anuário Brasileiro de Economia Florestal" of the Instituto Nacional do Pinho, Rio de Janeiro 1960. As far as I know the English text did not appear anywhere else before and it is very good to have this basic information in writing in "our" Journal. I shall keep my promise to give you more detailed and more up-to-date information in article-form, I expect by the end of this year.

I was greatly enjoyed to find again the Sansevieria described by Pate and Seale, from whom I learnt much about this fiber plant during my stay at the Everglades Experimental Station in 1952.

The "Book Reviews Section" contained again a book on Africa and Ethiopia in particular, which made me happy and sad again as well since mine is still not published. I shall let you know as soon as possible in case the unbelievable still happens.

Yesterday I received a letter from Mr. Glauber, Vice President, Von Kohorn Intern. Corp., to whom you gave my name. My assistant just went to Dr. Fróes and the chemist Wisniewski at the I.A.N., but I am afraid my answer to Mr. Glauber tomorrow will hardly be of any help; the information just does not exist at all.*)

*) My research had four letter results. Copy of my letter to Mr. Glauber is enclosed.

With kindest regards,

Yours sincerely,

Hans

Hans Ph. Huffnagel
FAO Agricultural Economist

Dr. David J. Rogers
Managing Editor
Economic Botany
The New York Botanical
Garden - Bronx Park
New York 58, N.Y.
U. S. A.

Mod. 2 — FAO

M A N I Ç O B E I R A S

Notes from: Mário Barroso Ramos - "Borracha"., São Paulo, no year (probably 1951)

The maniçoba-trees are very restricted in their geographic distribution.

The following table gives the location of the various Manihot species:

Species	Geogr. Region	Varieties	Common name
M. Glaziovii M. Arg.	Ceará, Nordeste	"Típica"	Maniçoba do Ceará
M. Piauhiensis, Ule.	Sudeste, Piauí and along the S. Franc. river	"Típica"	Maniçoba do Remanso
M. Heptaphilla, Ule.	Along the S. Francisco river	"Típica"	Maniçoba do S.Francisco
M. Dichotoma, Ule.	Sertões da Bahia	"Típica"	Maniçoba Jequié
M. Toledi, Lab.	Vila Nova;along the S.Francisco river	"Típica"	Maniçoba Vila Nova

Distinction is made between three commercial qualities i.e. Tijelinha, Chôro and Jequié. The T. and Ch. can be both M.Piauhienses and M.Glaziovii. The J. is a product of the M.Dichotoma. The Tijelinha is always very dirty and very moist. The Chôro is more a mixture of rubber drops with bark than a proper rubber. The Jequié is properly coagulated and almost without any moisture.

The "Maniçoba do Remanso" is a small tree of 3-4 m. high. The "Maniçoba do S. Francisco" is very similar to the "Remanso" and some consider the S. Francisco to be a variety of the former.

The "Maniçoba do Ceará" was considered for a long time to be the only maniçoba-producing tree. No doubt it occupies the major area of production. The trees reach a height of 8-12 m. with a wide and round shape crown.

The Maniçoba Jequié, discovered in 1900, was only classified in 1907 by Ule. It exists exlusively in the "sertão" of Jequié, Umburanas and Conquista (Bahia). The tree is 3-4 m. high.

The latex of M. Glaziovii is white fluid, whereas the latex of all other species are white-creamy to yellowish.

Collection of maniçoba latex is only carried out during about 40 days per year. The length of the tapping cut is in proportion to the diameter of the tree.

The way of tapping is more or less like the simple tapping methods of Hevea trees. The following table gives an impression of the average latex and dry rubber content of the various rubber producing trees:

	latex kg	d.r.c. kg	%
Seringueira (Hevea Brasiliensis)	6	2	33,3
Mangabeira (Hancornia speciosa)	0,200	0,070	35
Maniçoba (Manihot species)	0,350	0,120	33
Caucho (Castilloa species) (felled trees)	25		

The maniçoba latex is usually collected in cups similar to those used for the Hevea latex collecting. Coagulation is either spontaneously or by means of acids. The old system of leaving the latex to coagulate on the ground around the trunk is by now almost completely abandoned.

As mentioned above, the "chapas" (sheets) of maniçoba contain less impurities and moisture than the "tigelinhas" (small cups) or "chôro" (tears).

Characteristic for the finished maniçoba are its opacity, its white or yellowish color (cream color when well dried and in some cases as yellow as an egg-yolk) and also its typical smell which is different from any other Brazilian rubber (a less acid smell than mangabeira). The maniçoba is also more soft than the Hevea - Mangabeira - and Caucho rubber.

Additional notes

The Amazon Rubber Bank which holds the monopoly to buy and sell rubber from Hevea, Castiloa, Manihot and Hancornia species paid the following prices for maniçoba at Fortaleza during 1960 and sold maniçoba in São Paulo for the prices mentioned in the last column:

	Group	Humid. %	Cr$/kg Fortaleza	Cr$/kg São Paulo
Washed, dried, 3mm crêpe or pressed	1	0	105,23	140,93
	2	3	102,07	137,88
3mm crude sheets	1	10	94,71	130,78
	2	25	78,92	115,55
Tijelinha or chapa, crude	1	18	77,22	113,58
	2	25	70,62	107,25
	3	32	64,03	100,92
Chôro, crude	1	20	72,25	108,69
	2	30	63,22	100,03
	3	35	58,70	95,70
	4	45	49,67	87,04

T2/1 : 9840

12 ABR 1961

Dear Mr. Glauber,

Thank you very much for your letter of 30 March 1961 with a request for information on the possibilities of the use of rubberwood for pulp. I have pleasure in forwarding to you the following notes:

Malaya: experiments have been carried out by Mr. J.D. Peel, Chemist, Forest Research Institute, Kepong Malaya. I do not know whether Mr. Peel is still in Malaya but contact through the Director will probably give you the most detailed information. The following is a summary of an article by Mr. Peel, titled "Rubber Wood as Raw Material for Paper Pulp or Building Boards", which appeared in the Planters' Bulletin of the Rubber Research Institute of Malaya, no. 23, March 1956:

Fiber dimensions of Hevea Brasiliensis:

fiber length	1.4 mm
diameter (D)	0.022 mm
cell wall thickness (W)	0.0022 mm
$\frac{2W}{D-2W}$	0.25

Of importance are the relative values expressed by the ratios length/width and cell wall thickness/lumen diameter $\left(\frac{2W}{D-2W}\right)$. A high value of the former implies that paper made from such fibers would have high tearing resistance, and a value of the latter less than 0.5, when the thin walls may collapse and flatten easily, implies high tensile strength (Pinus

Mr. E.G. Glauber
Vice-President
Van Kohorn International Corporation
Von Kohorn Intern. Building
White Plains, N.Y.
U. S. A.

Mod. 3 – SPVEA

sylvestris 0.11, Eucalyptus regnans 0.37, Albizzia falcata 0.21). Paper from rubber wood would therefore not be expected to have high tearing resistance, although this could be improved considerably by admixture with 5-10% long-fibered pulp.

Chemical composition of Hevea Brasiliensis:

Holocellulose	65.7 %
Cellulose (Kurschner)	43.9 %
Lignin	23.3 %
Pentosan	18.0 %
Resin	3.9 %
Water solubles	6.0 %
1% Alkali solubles	19.7 %

The rubber wood sample has a low holocellulose content, which indicates, unfortunately, that pulp yields may also be low. This feature is consistent with the high pentosan content and alkali solubility and low cellulose content, since pentosans and hemicelluloses are easily lost in isolating holocellulose. Pulping and bleaching procedures will therefore require careful investigation, but the yields would certainly not be too low to discourage use of rubber wood (note: another sample of Albizzia falcata contained 72% holocellulose). The resin content is not high, but it will be necessary to see if residual rubber hydrocarbon remains on the surface of barked logs. The water solubility is high and that may cause higher chemical consumption. However, chemical analyses are of greater value when compared with the analyses of corresponding pulps with a view to observing the amounts of components removed during the process. The composition of rubber wood does not make it unattractive.

Note: Mr. Peel has contributed regularly similar studies to the Malayan Forester, quarterly of the Forest Department, Kuala Lumpur, Malaya (i.e. "Methods of measuring dimensions of fibres of pulpwood species" and "The suitability of rubber wood as a raw material for fibreboard", in Mal. For. Vol. XXI of April 1958 and "Fibre dimensions of suggested pulp wood plantation species, unfortunately without particular reference to Hevea or Shorea, in Mal. For. July 1959)

Ceylon: A study on the manufacturing of paper from rubber wood was made around 1945. Samples for manufacturing were sent to Australia and the results were presented in a report to the Ceylonese Government. I would advise you to write to the Director, Rubber Research Scheme, Dartonfield Estate, Horana, Ceylon.

Indonesia: Experiments were carried out by the Dutch in the Netherlands East Indies before the second World War. The results appeared in publications of the Dienst van het Boswezen (Forestry Service). No doubt you will be able to obtain translated

summaries through the help of the Director, Tropical Products Department, Royal Tropical Institute, Mauritskade 63,Amsterdam-O., The Netherlands.

Literature: Although it does not seem very likely, other publications may have appeared as abstract in the section pulp of the "Forestry Abstracts", prepared by the Commonwealth Forestry Bureau, Imperial Forestry Institute, South Parks Road, Oxford, England. Their Foreign Correspondent in the U.S., Mr. G.M.Jemison, U.S.D.A., Forest Service, Washington 25, D.C., could possibly inform you how to get the best answer to your question.

Shorea: the forestry experts in our Mission and the botanists in the Instituto Agronômico do Norte at Belém were rather surprised to hear about a Shorea brasiliensis. To their knowledge there are no Dipterocarpaceae in the Brazilian rain forests (the only place where they could appear); I have the impression that the mentioned name is wrong. Unfortunately I can not help you on information concerning Shorea. There are several hundreds of species of Shorea and some of those, like the Shorea stipularis with light wood, appear to make a very good pulp.

I hope the above information is of any help to you.

Yours sincerely,

H. Ph. Huffnagel
FAO Agricultural Economist

Mod. 3 – SPVEA

April 13, 1961

Dr. C. E. Rhines
U. S. Rubber Company
Research Center
Wayne, New Jersey

Dear Dr. Rhines:

Thank you very much for your letter of the 10th. I am sending under separate cover two samples of crude latex from the species, Manihot piauhyensis, which I collected in the state of Pernambuco during my recent trip.

The second sample I am sending is a crude rubber ball which was made by the natives in Bahia. I do not know whether you can do any good with the analysis of this concerning the hydrocarbon level; but if you can, I shall appreciate any knowledge you may have of it.

I appreciate your efforts on my behalf with these materials.

Very sincerely yours

David J. Rogers
Curator of Economic Botany

DJR: MDP

United States Rubber Company
Plantation Division
Research Center
Wayne, New Jersey

Telephone
OXbow 4-4000

Research & Development
Department

April 10, 1961

Dr. David J. Rogers
The New York Botanical Garden
Bronx Park
New York 58, New York

Dear Dr. Rogers:

Many plants have been investigated as potential rubber producers, but only one, Hevea brasiliensis, has attained importance in the field. The literature covering the topic is not satisfactory. The "Rubber Content of Miscellaneous Plants," Production Research Report No. 10, Agricultural Research Service, U.S.D.A., has some information.

"Ceara" rubber is not known to the rubber trade in this country. This product apparently was one of the early crude materials but never attracted developers. I should be willing to check the product for non-rubber constituents, particularly ash, protein and acetone extractable resins and for rubber hydrocarbon. Most products fall far below the 93% rubber hydrocarbon level of crude Hevea rubber. I suggest that you send me a few grams of the product for these preliminary tests.

A rubber bearing plant would have to display features outstandingly superior to Hevea brasiliensis to warrant development at this time. Current expansion is largely in the synthetic field.

Very truly yours,

C. E. Rhines

C. E. Rhines

mek

April 6, 1961

Dr. C. E. Rhines
Uk S. Rubber Company
Research Center
Wayne, New Jersey

Dear Dr. Rhines:

On a recent collecting trip to Brazil in connection with my research studies on the genus, Manihot, I encountered a oonsiderable number of plants of this genus which are tapped for rubber. Most of these species go under the heading of "Ceara" rubber. There are very likely several species in this complex which are quite interesting botanically.

However, before I begin any kind of research in connection with them, I would like to know if you can tell me anything about the value of Ceara rubber as an economic product. Is the rubber of sufficient quality to be worth continued researches in agricultural methods, breeding programs, etc.? I know that a small amount of this rubber if harvested and sold in Brazil.

I brought back with me several samples of the crude, congealed latex. Do you have any resources there at the Research Center for the evaluation of this latex sample? Would you or any of your colleagues be willing to look at these specimens?

If you have any ideas concerning the literature on Ceara rubber, I would be pleased to have some fairly up to date references. Furthermore, if you find within your research group someone interested in this subject, I would be very pleased to come and talk about the kinds of research that I would expect to do and about any kind of collaboration which I might perform in the event there is some interest in your group.

I look forward to hearing from you with any information which you may have.

Very sincerely yours

David J. Rogers
Curator of Economic Botany

DJR:MDP

file w/ rubber
bearing sp of
Manihot

MANUEL VIEIRA
LEVER BROS
PRAÇA DA REPUBLICA 468, 7º
SÃO PAULO, BRAZIL

Ou Manicoba, see
Soc. Nac. de Agric.
"A Borracha"
Pelo
Dr. Wenceslao Bello
Extracto do Primeiro Volume da Obra
"O Brasil suas Riquezas Naturaes, suas Riquezas
Publicada pelo centro Industrial do Brasil -
1908 -

Anuário Estatística do Brasil

Extractive production:

		metric tons	value (Cr$1000)
Maniçoba	1956	217	3,370
	1957	249	4,622
	1958	199	4,170

MANIÇOBA PRODUCTION

1957	M. Tons	Value 1000/Cr.
PIAUÍ	105	1 822
Oeiras	25	625
São João do Piauí	17	272
São Raimundo Nonato	30	360
Simplício Mendes	17	378
Outros	16	187
CEARÁ	90	1 972
Itapagé	50	1 250
Itapipoca	30	600
Outros	10	122
BAHIA	31	604
Barra	6	104
Jequié	14	278
Remanso	6	150
Outros	5	72

--*-*-

Source: Produção Extrativa Vegetal - 1957
Serviço de Estatística da Produção
Ministério da Agricultura

Mod. 2/A —FAO

MANIÇOBA PRODUCTION

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Source: Produção Extrativa Vegetal - 1957
Serviço de Estatística da Produção
Ministério da Agricultura

Mod. 2/A —FAO

Production of Manipoba in Brasil.

State PIAUÍ
Phys. Zone I Sertão
Mun. 1 Oeiras
" 2 São João do Piauí
" 3 São Raimundo Nonato
" 4 Simplício Mendes

State CEARÁ
Phys. Zone II Litoral
Mun. Itapipoca
Phys Zone III Sertão Centro Norte
Mun. Itapagé

State BAHIA
Phys Zone IV Jequié
Mun. Jequié
Phys Zone V Sertão do São Francisco
Mun Remanso
Phys Zone VI Médio São Francisco
Mun. Barra.

Mod. 2/A —FAO

MANIÇOBA

Purchases by the Banco de Crédito da Amazônia

1957

ORIGIN	TOTAL kg	TOTAL Cr$	Quality	
NON SPECIFIED	58.531	2.186.528,60	Crude Maniçoba	
" "	138.660	7.095.527,80	Washed Maniçoba	
	SPECIFIED			
	BAHIA	CEARÁ	R.G.DO NORTE	S.PAULO
Crude Maniçoba	-	-	-	58.531
Washed Maniçoba	54.660	54.000	30.000	-

1958

	BAHIA	CEARÁ	R.G.DO NORTE	SÃO PAULO
Crude Maniçoba kg	-	-	-	57.070
Cr$	-	-	-	2.183.927,90
Washed Maniçoba kg	70.320	52.800	15.000	-
Cr$	3.834.811,20	2.677.488,	763.050,	-

1959

	BAHIA	CEARÁ	R.G.DO NORTE	SÃO PAULO
Crude Maniçoba kg	-	-	-	122.104
Cr$	-	-	-	7.030.365,80
Washed Maniçoba kg	108.420	70,800	15.000	-
Cr$	9.072.697,80	5.316.361,20	953.850,	-

Mod. 2/A —FAO

MANIÇOBA

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Mod. 2/A —FAO