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The Introduction of the India-rubber Tree into India.

The introduction into India of the true Pará india-rubber (*Hevea*) may be said to be now fairly inaugurated. If it is not a great success, I think, without doubt, the fault will be that it has not been planted out in suitable localities.

The india-rubber tree (*Hevea*) grows naturally throughout the Amazon valley, with the exception of certain localities. I found it very abundant high up on the Orinoco, above the junction of Guaviare (the latter stream by right indeed should be styled the Orinoco). It is plentiful on the banks of the Cassiquiare, that curious bifurcation of the Orinoco by which it contributes water to the Rio Negro, and converts Guagána into an immense island. I do not know how far it may extend up the Marañon into Peru, never having been there. It is abundant and very fine about the cataracts of the Tapajos, and it was on this river that I obtained the seeds which produced the plants now to be despatched from Kew to India.

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In its native forests it grows dispersed among the other forest trees, two or three trees rarely being found in juxtaposition. In appearance the *Hevea* are handsome trees, with straight cylindrical trunks. They differ wholly from the Ulé trees—the Central American india-rubber tree (*Castilloa*), which I had seen in Mosquito and Nicaragua. The wood is soft and perishable. As in the great majority of tropical American trees, the bark is not very thick. It is of a grey colour on the surface, but when scraped (as has frequently to be done before it is possible to tap them in some of the moister districts, owing to the thick growth of the moss ferns and orchids on the bark) approaches in appearance and colour the coat of a light bay horse. Under the native mode of tapping, however, they soon present a warty disfigured appearance. The seeds grow, three together, in a sort of hard pod. This pod bursts when it is ripe and becomes heated by the sun with a sharp popping sound, and scatters the seed for a considerable distance around the trees. I have been assured by an Englishman, long resident in the country as a trader, than an oil closely resembling linseed oil in its properties is to be extracted from the seed.

It is worthy of notice that the tree casts its seed at the same time of year both on the Orinoco and Amazon, although the wet and dry seasons are reversed in the two valleys. It would be interesting to note whether the seed continues to fall at the same time of year in their new home in India.

The rain-fall varies considerably in different districts where the *Hevea* are found. In some districts the year is nicely divided into wet and dry seasons, each of about six months duration. In others it rains more or less the year round. In such districts it is more difficult to collect the caoutchouc profitably. If the stem of the tree be wet when it is tapped, the milk spreads over the surface of the bark and is lost. Again, if a shower should come on before the milk is collected from the cups, and it become mixed with water, it will not congeal, and so is also lost.

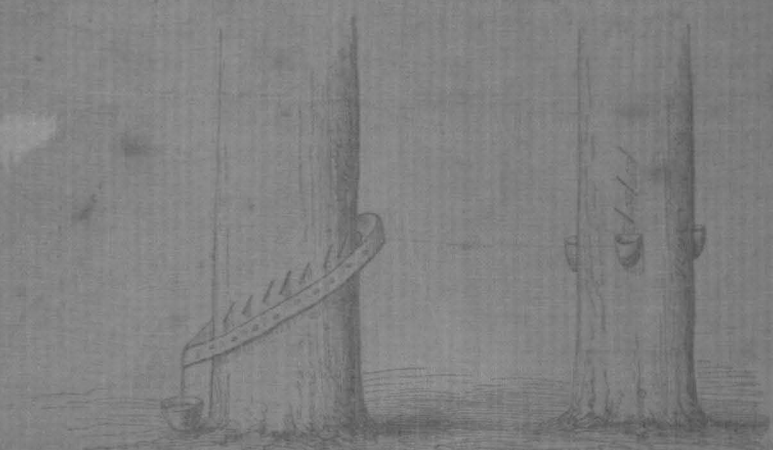
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When the native has discovered for himself a district in which "ciringa" trees are sufficiently numerous and near together, he first connects them together by cutting a "picado," or path, with his bush knife. Having thus discovered their relative bearing, he next straightens and clears out his paths, endeavouring at the same time to take in as many trees as possible in each path, and to make all the paths converge to a certain spot where he has put up his "rancho" or "barraca." This done, and having collected a supply of the old nuts of the inaja (*Maximiliana Regia*), or other palm trees, or of the outer shell of the Brazil nut, he is ready to commence operations on the first fine day. There is some diversity in the manner of taking the rubber milk on the Amazon. In some districts long strips are procured from the inner pith of the foot stalk of the leaf of the inaja or the Bacaba palm. These are tacked obliquely round the stem of the trees, with sharpened pieces made out of the hard covering of the same leaf stalks. This being smeared on the inside with wet clay serves to form

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Tin cups are used. They are made slightly concave on one side in order to fit the convexity of the tree trunk. These are fastened to the tree with a piece of kneaded clay, of which the "ciringero" carries a supply in his bag. The tapping always takes place as soon as there is light enough in the forest to see by. One man is apportioned to each path, say, containing 100 trees. When he has tapped and cupped his trees he sets down at the end of the walk for half an hour or so. As soon as he perceives that the tree last tapped has ceased to drip the milk, he starts at a trot on the back track, detaching and emptying the cups into his calabash as quickly as possible. The cups he leaves up side down at the base of the trees. Speed throughout is a great object, as the milk speedily coagulates; then it can only be sold for an inferior price as "sernambi." When the men arrive at the central hut, from their different paths, they empty their milk into one of the large native earthenware pans. Care is taken to squeeze out with the hands all the already coagulated curd-like masses. These are thrown to one side to be made up into balls of "sernambi." Earthen pots resembling miniature kilns are placed over small fires and the "ciringero" sits down to the really tedious part of the business. He drops a handful or so of the palm nuts down the narrow neck of his little kiln and forthwith arises a dense smoke. He now takes his wooden mould—not unlike a fives bat in form—and holding it over the pan pours some of the milk over it, keeping it turned, so that it shall not run off before he succeeds in drying it in an even surface, as it soon does as it is

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I believe very good rubber might be made by simply allowing the milk to congeal in moulds during the night of the day on which it has been tapped, if, on the following morning, it were placed under a very powerful press in order to expel the fluid contained in the cheese-like cells. When fresh, the milk has a very agreeable smell and taste, but it soon becomes putrid. The child of an Indian woman employed on my "ciringal" used to drink considerable quantities of the fresh milk; I suppose it was rendered harmless by becoming mixed with saliva, as it will not congeal if mixed with water.

There are many trees in tropical America which produce milk from the bark yet more copiously than the *Hevea*. Who knows but that some day equally economic use may be made from some of them?

With regard to the success of the introduction of the *Hevea* into India, much will, of course, depend on the nature of the soil on which they are planted. In Venezuela and Brazil, I found the *Hevea* growing on two classes of country; on the high clayey uplands embraced by the branching rivers, but still at considerable distances from them, and on the low alluvial lands immediately bordering on them.

From the far greater size and apparent age of the trees, I cannot but imagine that the original locality of the tree was in these uplands. The fact of their being so generally found on low lands bordering on the waters may be accounted for. The seeds are scattered widely when they burst; many of them fall into ravines and gullies and are carried by the watercourses of the rainy season into the rivers, to be cast up by tide and windy squalls, and readily take root on the rich soil of the alluvial islands and shores of the back waters. In illustration of this I have frequently seen a string of *Hevea* growing even on a beach, backed by sandy lands, far from their proper localities.

Although I know nothing personally about the climate of the Eastern Indies, yet I imagine, from what I have read, that the Malay peninsula is most likely to combine the climatic conditions required by the india-rubber tree of the great valley of South America.

It is a mistake—naturally fallen into by the travellers who have passed up and down the great water-ways of South America, without having penetrated far into the interior high clay lands enclosed by them—to suppose that the *Hevea* are confined to the low, often flooded islands and margins of rivers. Growing on these clayey uplands, I met with the largest of these trees, rivalling in height and girth all but the very largest trees which grow in these parts.

At the same time, perhaps, on rich alluvial lands would be found the best localities for establishing plantations of these trees. Nor do I think it would prove a serious drawback if they should be planted on lands which become annually flooded, to the depth of a foot or so, for a few weeks in the year. The land selected should, I think, be heavily timbered. The timber to be cut down some eight or nine weeks before the first rains are expected, in order to give time to get a good burn over the ground. The ground also should be cleaned up sufficiently, by piling and burning the logs; those remaining to be rolled on one side. The plants might be set out in walks, converging to a central point, in order to facilitate the collecting of the milk. I would strongly advise that the *Hevea* should be planted alternately with cacao; these low bushy trees would shade and keep the ground moist, without interfering in the least with the *Hevea*, which would soon tower above them. This plan would also much increase the value of the plantations.

Another thing I would recommend. The milk of these trees is yielded in much greater abundance near the ground, and when, by some chance cause, an elbow of root is protruded above the ground, the flow of milk from it, on its being tapped, is very much greater than from any other part of the tree. Now would it not be possible to devise some method by which the roots might be induced to put up elbows above the surface of the ground? Great caution must be used, in tapping the trees, not to penetrate beyond the bark into the wood. Great numbers of trees are destroyed in this manner on the Amazon. As soon as the wood is injured, certain species of boring beetles attack the tree, and it soon dies.

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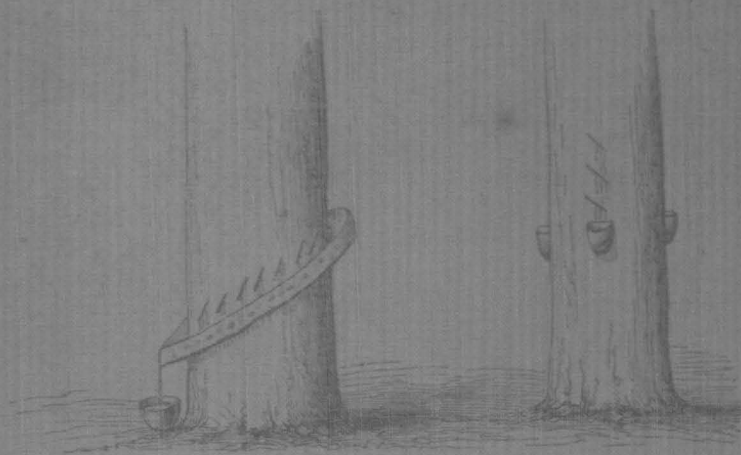
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The Introduction of the India-rubber Tree into India.

The introduction into India of the true Pará india-rubber (*Hevea*) may be said to be now fairly inaugurated. If it is not a great success, I think, without doubt, the fault will be that it has not been planted out in suitable localities.

The india-rubber tree (*Hevea*) grows naturally throughout the Amazon valley, with the exception of certain localities. I found it very abundant high up on the Orinoco, above the junction of Guaviare (the latter stream by right indeed should be styled the Orinoco). It is plentiful on the banks of the Cassiquiare, that curious bifurcation of the Orinoco by which it contributes water to the Rio Negro, and converts Guagána into an immense island. I do not know how far it may extend up the Marañon into Peru, never having been there. It is abundant and very fine about the cataracts of the Tapajos, and it was on this river that I obtained the seeds which produced the plants now to be despatched from Kew to India.

I also found it growing in the interior between the Tapajos and Xingu. The rivers from which the largest supply is now brought by the traders are the Purús and the Madeira.

In its native forests it grows dispersed among the other forest trees, two or three trees rarely being found in juxtaposition. In appearance the *Hevea* are handsome trees, with straight cylindrical trunks. They differ wholly from the Ulé trees—the Central American india-rubber tree (*Castilloa*), which I had seen in Mosquito and Nicaragua. The wood is soft and perishable. As in the great majority of tropical American trees, the bark is not very thick. It is of a grey colour on the surface, but when scraped (as has frequently been done before it is possible to tap them in some of the moistest parts of the forest) it is of the moss ferns and orchids on the bark) a greenish-grey and colour the coat of a light bay horse. Under the native mode of tapping, however, they soon present a warty disfigured appearance. The seeds grow, three together, in a sort of hard pod. This pod bursts when it is ripe and becomes heated by the sun with a sharp popping sound, and the seed for a considerable distance around the trees. I have been assured by an Englishman long resident in the country as a trader, than an oil closely resembling linseed oil in its properties is to be extracted from the seed.

It is worthy of notice that the tree casts its seeds at the same time of year both on the Orinoco and Amazon, although the wet and dry seasons are reversed in the two valleys. It would be interesting to note whether the seed continues to fall at the same time of year in their new home in India.

The rain-fall varies considerably in different districts where the *Hevea* are found. In some districts the year is nicely divided into wet and dry seasons each of about six months duration. In others it rains more or less the year round. In such districts it is more difficult to collect the caoutchouc profitably. If the stem of the tree be wet when it is tapped, the milk spreads over the surface of the bark and is lost. Again, if a shower should come on before the milk is collected from the cups, and it become mixed with water, it will not congeal, and so is also lost.

The range of temperature in the india-rubber country is from about 73° to 88° throughout the year; on the lower Rio Negro it increases at the noon to 100°.

From what has been said, it may be seen that the main part of the rubber must be collected during the dry season, although the "ciringeros," who live near their "ciringals," or india-rubber walks, improve their opportunity by tapping their trees whenever fine days occur during the rainy season. The "ciringero" occasionally gives his trees a rest, but the trees are always tapped excessively. It is astonishing to what a degree they will stand tapping. I have seen large trees apparently none the worse, further than that they were somewhat disfigured by the knarled appearance of their bark, the owner of which assumed

me he had tapped for 20 years successively, but then he tapped them himself, and had an interest in their preservation. These same trees scattered their fruit in abundance. An industry more in accordance with the character of the South American it were difficult to find, the labour so small and yet so remunerative. I have myself collected 10 lbs. of rubber per day, tapping 70 or 80 trees of various size. An experienced Tapuyo Indian can collect much more. If such be the case in the woods, where the trees are scattered and much time is necessarily lost in getting from one tree to another, what will be the profit of a well arranged plantation of these trees under good supervision? In the "igapo," or low lands off the rivers, flooded during the rise of the waters, there is a spurious kind of *Hevea*. It is called by the natives "ciringa do igapo" or "barigordo," from its habit of growing with a bulged stem. The seeds of this species are much longer and larger than those of the true rubber. The milk appears to be worthless.

When the native has discovered for himself a district in which "ciringa" trees are sufficiently numerous and near together, he first connects them together by cutting a "picado," or path, with his bush knife. Having thus discovered their relative bearing, he next straightens and clears out his paths, endeavouring at the same time to take in as many trees as possible in each path, and to make all the paths converge to a certain spot where he has put up his "rancho" or "barraca." This done, and having collected a supply of the old nuts of the inaja (*Marimiliana Regia*), or other palm trees, or of the outer shell of the Brazil nut, he is ready to commence operations on the first fine day. There is some diversity in the manner of taking the rubber milk on the Amazon. In some districts long strips are procured from the inner part of the foot stalk of the leaf of the inaja or the Bacaba palm. These are tacked obliquely round the stem of the trees, with sharpened pieces made out of the hard covering of the same leaf stalks. This being smeared on the inside with wet clay serves to form

a channel to collect and conduct the milk into the cup placed to receive it. In the other manner, which I consider the better, three or four cuts about an inch long are made in the bark with a minute axe. The cups are put on in a ring round the trunk, usually a span or more apart. In this way the number of cups is proportioned to the size of the tree.

Tin cups are used. They are made slightly concave on one side in order to fit the convexity of the tree trunk. These are fastened to the tree with a piece of kneaded clay, which the "ciringero" carries a supply in his bag. The tapping always takes place as soon as there is light enough in the forest to see by. One man is appointed to each path, say containing 100 trees. When he has tapped and cupped his trees he sets down at the end of the walk for half an hour or so. As soon as he perceives that the tree last tapped has ceased to drip the milk, he starts at a trot on the back track, detaching and emptying the cups into his calabash as quickly as possible. The cups he leaves up side down at the base of the trees. Speed throughout is a great object, as the milk speedily coagulates; then it can only be sold for an inferior price as "sernambi." When the men arrive at the central hut, from their different paths, they empty their milk into one of the large native earthenware pans. Care is taken to squeeze out with the hands all the already coagulated curd-like masses. These are thrown to one side to be made up into balls of "sernambi." Earthen pots resembling miniature kilns are placed over small fires and the "ciringero" sits down to the really tedious part of the business. He drops a handful or so of the palm nuts down the narrow neck of his little kiln and forthwith arises a dense smoke. He now takes his wooden mould—not unlike a fives bat in form—and holding it over the pan pours some of the milk over it, keeping it turned, so that it shall not run off before he succeeds in drying it in an even surface, as it soon does as it is

passed backward and forward through the smoke; this is continued, one coating of milk after another, until he has finished the supply of milk for the day, he then sticks his mould up in the thatch for the repetition of the process next day, and until he is satisfied with the thickness of the "bureuit."

I believe very good rubber might be made by simply allowing the milk to congeal in moulds during the night of the day on which it has been tapped, if, on the following morning, it were placed under a very powerful press in order to expel the fluid contained in the cheese-like cells. When fresh, the milk has a very agreeable smell and taste, but it soon becomes putrid. The child of an Indian woman employed in my "ciringal" used to drink considerable quantities of the fresh milk; I suppose it was rendered harmless by becoming mixed with saliva, as it will not congeal if mixed with water.

There are many trees in tropical America which produce milk from the bark yet more copiously than the *Hevea*. Who knows but that some day equally economic use may be made from some of them?

With regard to the success of the introduction of the *Hevea* into India, much will, of course, depend on the nature of the soil on which they are planted. In Venezuela and Brazil, I found the *Hevea* growing on two classes of country; on the high clayey uplands enforced by the branching rivers, but still at considerable distances from them, and on the low alluvial lands immediately bordering on them.

From the far greater size and apparent age of the trees, I cannot but imagine that the original locality of the tree was in these uplands. The fact of their being so generally found on low lands bordering on the waters may be accounted for. The seeds are scattered widely when they burst; many of them fall into ravines and gullies and are carried by the water-courses of the rainy season into the rivers, to be cast up by tide and windy squalls, and readily take root on the rich soil of the alluvial islands and shores of the back waters. In illustration of this I have frequently seen a string of *Hevea* growing even on a beach, backed by sandy lands, far from their proper localities.

Although I know nothing personally about the soil of the Eastern Indies, I imagine, from what I have read, that the Malayan islands were likely to combine the climatic conditions required by the indigenous rubber tree of the great valley of South America.

It is a mistake—naturally fallen into by the travellers who have passed up and down the great water-ways of South America without penetrating far into the interior high clay lands enclosed by them—to suppose that the *Hevea* are confined to the low, often flooded lands and margins of rivers. Growing on these clayey uplands, I met with the largest of these trees, rivaling in height and girth all but the very largest trees which grow in these parts.

At the same time, perhaps, on rich alluvial lands would be found the best localities for establishing plantations of these trees. Nor do I think it would prove a serious drawback if they should be planted on lands which become annually flooded, to the depth of a foot or so, for a few weeks in the year. The land selected should, I think, be heavy timbered. The timber to be cut down some eight or nine weeks before the first rains are expected, in order to get a good burn over the ground. The ground also should be cleared up sufficiently, by piling and burning the logs; those remaining to be rolled on one side. The plants might be set out in walks, converging to a central point, in order to facilitate the collecting of the milk. I would strongly advise that the *Hevea* should be planted alternately with *meado*; these low bushy trees would shade and keep the ground moist, without interfering in the least with the *Hevea*, which would soon tower above them. This plan would also much increase the value of the plantations.

Another thing I would recommend. The milk of these trees is yielded in much greater abundance near the ground, and when, by some chance cause, an elbow of root is protruded above the ground, the flow of milk from it, on its being tapped, is very much greater than from any other part of the tree. Now would it not be possible to devise some method by which the roots might be induced to put up elbows above the surface of the ground? Great caution must be used, in tapping the trees, not to penetrate beyond the bark into the wood. Great numbers of trees are destroyed in this manner on the Amazon. As soon as the wood is injured, certain species of boring beetles attack the tree, and it soon dies.

From what I have seen of these trees in their native country, where I have occasionally known them planted, and have made some experiments on their growth myself, I have ventured on the foregoing remarks, feeling, at the same time, satisfied that this will be found to be quite the best manner of forming a plantation on a large scale. If this plan were followed in a suitable locality on rich alluvial soil, the tapping of the young trees might commence gradually in from seven to ten years after planting out, and would soon become the source of a great revenue.

H. A. WICKHAM.

India Office

7th November 1876

Sir,

I am directed by the Secretary of State for India in Council to forward to you 6 copies of a note on the Introduction of the India rubber tree into India by Mr. H. A. Wickham.

I am

Sir

Your obedient Servant

Clement A. Marsham
Assistant Secretary
Revenue Department

The Secretary
Revenue Department
Fort Saint George

1. To the Board of Commissioners
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