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SOUTH AMERICA CAN AT BEST SUPPLY ONLY FRACTION OF U. S.' RUBBER NEEDS

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A standard work on vegetable raw materials published in 1928 lists 488 plants known to yield rubber. The number known has been greatly increased since, and is usually roughly stated as more than 1,000. The Russian search for rubber sources is said to have revealed as many as 7,000, of which only 14 were considered of economic value. It is quite evident that a large number of plants have a milky sap or latex which solidifies as a sticky elastic rubber-like substance; also that of this very large number, only a few have up to the present time been of much practical importance. The overwhelmingly greater part of the entire world supply of rubber is, in fact, derived from a single botanical source, viz., the Brazilian rubber tree *Hevea brasiliensis*, native in parts of the Amazon region. It was the transplantation of this to Ceylon in 1876 by seeds obtained in Brazil, and by plants to Singapore, and its large scale cultivation in the Malay Peninsula and the East Indies, that made possible the rapid expansion in the use of rubber which has taken place in the last thirty years.

The world's production of rubber has recently (1940) reached a total of 1,500,000 tons. Of this vast quantity, more than 1,200,000 tons were produced in Malaya and the Netherlands East Indies, in the proportion respectively of about seven to five. Most of the remainder was contributed by other Asiatic countries: Ceylon almost 100,000 tons; India a small amount; the now Japanese-occupied French Indo-China

and Thailand, Burma, Sarawak and North Borneo, altogether somewhat less than 200,000. Compared with all this, the African and South American production of about 20,000 tons each is truly insignificant, especially in view of present large requirements of the United States. In 1940, 670,000

has sparse population, and in most of the places where the trees are found the operators of rubber concessions and the enterprising prospectors who exploit the territory adjacent to the upper reaches of the rivers are obliged to bring their labor from more populous regions. The conditions of living

in remote places in the forest are often of notable difficulty. The hardships of the rubber gatherer's life—its isolation and attendant dangers—have become proverbial in all places where the labor needed may be enlisted; likewise, rumors of high maintenance costs which must be paid by workers in places where all supplies are brought in from distant cities. Costs multiply with each shift or relay on the way up the rivers.

Because of these conditions and others—including lack of proper sanitation and accompanying high incidence of disease—that surround the gathering of forest-grown rubber, only the most favorably situated parts of the Amazon territory can produce at all in com-

petition with the Far East's compact and well managed rubber estates and auxiliary thousands of small plantations, operated in a region with an abundant population.

With the production of these eastern plantations now cut off, however, the existence of wild rubber trees in the Amazon again becomes a matter of importance. The number of such trees is unknown, but has been estimated at 200,000,000 to 300,000,000. The questions of how much rubber may actually be obtainable from them, and how soon it may become available, are somewhat difficult to estimate.



A DAILY TASK IN A BRAZILIAN RUBBER DEPOT

Amazon crude rubber comes to market in the form of large balls, produced by pouring the latex collected on a paddle or stick upon which it coagulates when revolved in the smoke of a palm nut fire. At the warehouse each ball is cut in two, as shown above, for examination before shipment. If the layers are not uniform they can be separated and pulled apart for grading and sorting. Photograph by Marshall Field Botanical Expedition to Brazil.

tons were used in our country (out of an importation of more than 800,000, more than half of the world's production).

WILD RUBBER OF THE AMAZON

Before the development of the eastern plantations the Amazon basin was without a rival as a source of supply. *Hevea* trees of several species there grow spontaneously in the forests of an immense region including the northern states of Pará and Amazonas, northern Matto Grosso, and the territory of Acre (all in Brazil); and parts of adjoining Bolivia, Peru, Ecuador and southern Colombia. The greater part of the territory

One can only judge from past records and such indications as exist. The peak of production in the Amazon was reached just before the eastern plantations began to yield rubber in quantity. The average price of Pará rubber at the time was equivalent to about \$1.10 per pound. As much as ten or eleven shillings per pound is said to have been asked in 1910 by exporters in Manaós and Pará.

In 1912 the Asiatic production, which began with one thousand tons in 1907, had reached 28,000, while 42,000 tons were produced in Brazil, and enough more from extra-Brazilian parts of the Amazon region to increase the South American total by a few thousands. The very next year the rapidly increasing East Indian output surpassed that of Brazil, and in succeeding years doubled and tripled. The Amazon rubber boom then definitely collapsed, though not one-tenth of the wild rubber trees of Brazil and surrounding territory had been utilized. With falling prices (50 cents a pound in 1920, then suddenly less than 20 cents) the Amazon production continued to diminish, becoming less and less profitable until it reached a low point of 8,000 tons gathered in the most accessible localities only. Since then there has been only a slight recovery. The 1939-40 production was 20,000, the exportation 12,000 tons—barely enough for a week's supply in the United States alone.

Not all the rubber of the Amazon is prime Pará rubber, and not all of it is the product of *Hevea brasiliensis*. Various other species of Hevea trees yield rubber of slightly inferior characteristics, but help increase the total output, and even trees of other genera, Castilla or "caucho," and Sapium, contribute to the bulk. The first rubber plantations on the American continent were, indeed, of Mexican Castilla, but were abandoned when the superiority of Hevea was realized. Sapium exists in several species at the higher elevations on the western margin of the Amazon basin, in Bolivia, and in the forest or "montaña" of Peru to Colombia and Venezuela. Indeed, much of the rubber exported from the latter countries consists partly or predominantly of Sapium and is esteemed as good rubber, excellent for many important purposes, although when it is mixed in the field with Hevea rubber it is considered an adulteration of the latter.

In connection with Sapium rubber it is interesting to recall that seeds of species of Sapium for experimental planting in the southern Caucasus region were gathered some years ago in the Andean countries by a Russian expedition. On arrival in Russian territory, after their long journey, the seeds would not germinate and it is said that the chief of the Russian Bureau of Plant Industry only with great difficulty was able to save the explorers concerned from execution for sabotage.

The conditions surrounding the gathering of forest-grown rubber have in the course of years been somewhat improved, but in most respects remain essentially as they were when Brazilian rubber production was a matter of great importance to the world.

LABOR IS PROBLEM

Methods of tapping the trees have become less destructive and more efficient. Better sanitation and medical service, and more rapid and dependable river transportation can be provided without great difficulty, but the labor supply is, unfortunately, as scarce as ever in most parts of the Amazon, and must be recruited or supplied from outside, though it is said that the number of rubber gatherers engaged at no time exceeded five thousand.

Introduction of labor from elsewhere raises an always troublesome immigration question, and there are few places in the American tropics with an excess population. Nevertheless, granted a considerable increase in price to cover risks and cost of collection and transportation, with enough more guaranteed to stimulate a special effort, an output of 50,000 tons within a few years would seem a not unreasonable expectation, and if the demand should continue, in time perhaps twice as much would become available.

Miscellaneous minor sources of rubber will be utilized to the fullest practicable extent, such as the guayule of which Mexico in 1940 produced 4,000 tons, but this, like the dandelion root kog-saghiz (a perennial planted in Russia in 1940 to the extent of 170,000 acres), requires several years of growth in order to attain any considerable size and rubber content. Commerce will doubtless be renewed in some species of rubber now practically abandoned, such as Ceará, and Manicoba.

Rubber tree seeds and seedlings are being currently distributed to various tropical American countries, where with proper care they should eventually contribute to the rubber supply of the western hemisphere, and thereby help reduce future dependence on eastern production. In this connection it may be interesting to note that more than one-half of all the rubber of Asia is produced on small plantations averaging not more than about 100 acres each.

A search is also being made for a rubber source plant that might be grown on a large scale as an annual crop, but it appears at present to be very unlikely that within a

lifetime either a new rubber yielding plant or new plantations in the western hemisphere will substitute or displace the Hevea rubber of the Asiatic tropics which undoubtedly



A LOT OF THAT RARE SUBSTANCE, RUBBER—

—yet it's only a drop in the bucket, considering our national needs. This photograph, taken by the Marshall Field Botanical Expedition to Brazil, shows a typical scene in a warehouse in the rubber-growing state of Pará, at Belem, the Amazon delta port from which most of the meager South American supply is shipped.

will become available again, by military force or otherwise.

SYNTHETICS MAY PROVE BEST SOLUTION

There appears, on the other hand, to be a distinct possibility that the present loss of the eastern plantations will lead to achievements in the production of synthetics that in the long run may reduce even prime plantation or Pará rubber to a secondary or competing place.

A 100,000-ton synthetic production is apparently to be expected within a year, as an aid to the existing, carefully rationed stock of crude and reclaimed rubber. The reclaimed product may enter into the output of rubber manufactures to the extent of more than the usual one-third.

In the meantime it is apparent that if a relatively speedy restoration of the rubber supply from the East cannot be achieved, the solution of the rubber supply problem will have to be assumed mainly by the chemical industries.

A graphic synopsis of noteworthy facts about the sugar industries, both cane and beet, is presented by exhibits in the Hall of Food Plants (Hall 25).

Museum Hours Extended for Summer Period

Summer visiting hours, 9 A.M. to 6 P.M. daily, including Sundays and holidays, will go into effect at Field Museum on May 1, and continue throughout the period up to and including September 7 (Labor Day).



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