

VALUE CHAIN ANALYSIS IN LIBERIA

Rubber

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Abbreviations

AfDB: African Development Bank

CBL: Central Bank of Liberia

CNG: Compressed Natural Gas

GHG: Greenhouse Gas

GoL: Government of Liberia

KOAFEC: Korea Africa Economic Cooperation

MoA: Ministry of Agriculture

R&D: Research and Development

SWOT: Strength, Weaknesses, Opportunities, Threats

TSR: Technically Specified Rubber

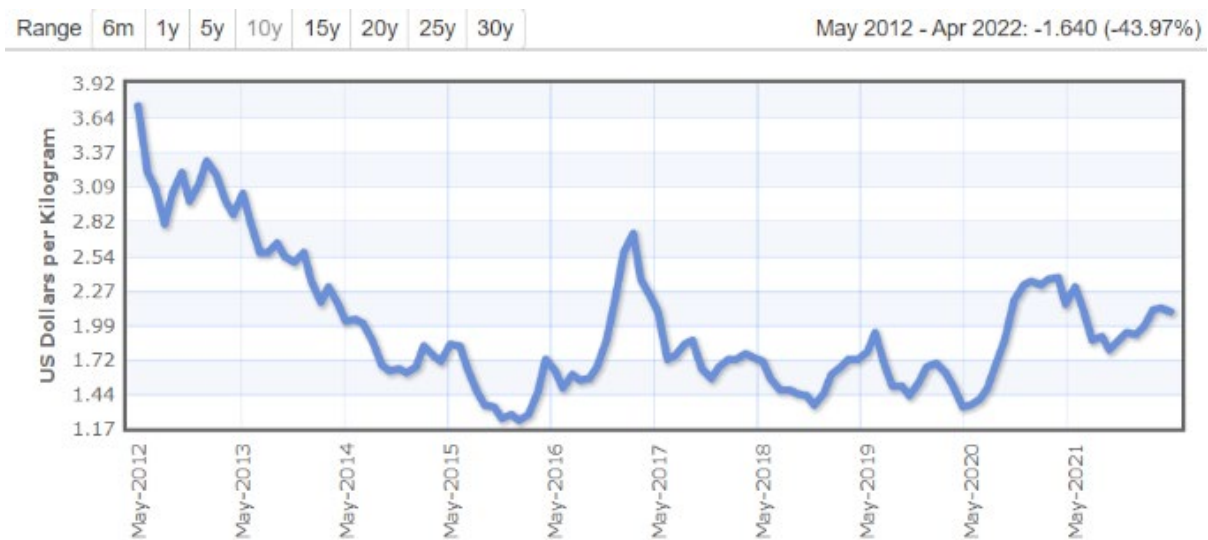
VC: Value Chain

VCA: Value Chain Analysis

Rubber Thesis

Rubber remains key to the Liberian economy. It serves as one of the country’s strongest foreign exchange earners and primary agricultural export crop. Some data indicate that in Liberia rubber trees cover up to 200,000 hectares of land, but despite this, the rubber industry has experienced a drastic slowdown in recent years due to a lack of investments in concessions, which represent 70% of the country’s production, and the abandonment of private farms, 30% of production.¹ Additionally, over the last two decades, an inadequate amount of existing rubber farms have been replanted. These issues are compounded by the effects of a volatile international price market for up to the last 10 years; the price of rubber has not fully recovered since the crash in commodities’ pricing in 2015 and the peaks and troughs since then have been even more extreme.² This unpredictable market has pushed manufacturers that use rubber to explore alternate sources and for investors to seek opportunities with more security than found at the raw material level. Both outcomes have left the Liberian economy vulnerable.

Chart 1. 10-year Rubber Price (US\$/kg)



Rice and cassava are the main staple foods, while oil palm, cocoa, and rubber are the dominant export tree crops. So given the volatile price of rubber on international markets as shown in Chart 3, the GOL must be aggressive in its efforts to push the rubber industry away from only harvesting and selling the raw material to incentivizing investments in value added production and exportation. There is scope for the expansion of Liberia’s capacity for natural rubber production since access to land is not a constraint, and there is a large regional and international market for ribbed smoked sheets, rubber crepes and various rubber products from concentrated latex.³

¹ LADA Value Chain Analysis Assessment Report June 2016

² <https://www.indexmundi.com/commodities/?commodity=rubber&months=120>

³ <https://www.rvo.nl/sites/default/files/2018/07/Sector-Scan-Liberia-Agric.pdf>

Rubber Sector

Natural rubber comes from latex, a sticky, milky colloid, that is collected from the Para rubber tree then mixed with chemicals, refined, and processed for manufacturing. It is used to produce various products from rubber gloves to tires to chewing gum and running shoes. Its wide application makes it a commodity that could boost and transform the Liberian economy if appropriately managed.



Latex is harvested by making incisions into the bark of the tree to cause a milky fluid to flow into “collection cups” in a process called tapping. The latex is then allowed to coagulate in the collection cups and ultimately processed into dry forms for marketing and commercial manufacturing; natural rubber is processed either alone or in combination with other materials.

Rubber plantation concessions are extremely integral to the sector as they produce over 70% of the country’s rubber output and account for roughly 50% of the area of all tree crops under cultivation, smallholders account for the rest. The extent of the influence concessions has on the economy goes beyond physical land coverage and volume output but also on the prices paid for raw products in the domestic market. These concessions use volatile world market prices to guide the prices they offer smallholder farmers for their produce but since smallholder farmers do not have the

capacity to export, the prices set by large concessions is directly proportional to the sustainability of the small holder rubber farming sub-sector.

The share rubber of rubber exports to total exports rose from 24% in 1987 to 77% in 1997 as the economy became more agriculture based through periods of instabilities, but it has since fallen to close to 11% in 2020 as other exports, namely iron ore, gold, and shipping licenses have risen.⁴ That said, rubber is one of the top three (by USD value) products exported by Liberia and brought in \$115 million in 2020. It is a strong hard currency earner and, consequently, one of the pillars of the Liberian economy. As such, the MoA, in collaboration with its stakeholders, developed a plan for the rubber industry up to 2040 that details the replanting and new planting of 200,000 hectares at a total projected cost of over \$1 billion to yield direct export income of \$12 billion.⁵

Documented commercial rubber production in Liberia started when in 1926 Firestone obtained a 99-year lease for one million acres of land suitable for producing rubber and other agricultural products in exchange for a \$2.5 million loan to GoL. Since then, Firestone continues to produce 90% of the rubber output in the country. Firestone is now owned by Bridgestone, ranked the world’s most valuable tire brand in 2017.⁶ Over the years the agreement between Firestone and the Liberian government has been reviewed and edited to better meet the demands of the government but overall, Firestone remains a major player in the industry, often dictating purchase prices offered to farmers and significantly influencing the contribution of the sector to public funds.

⁴ <https://oec.world/en/profile/country/lbr>

⁵ LADA Value Chain Analysis Assessment Report June 2016

⁶ <https://www.tyremarket.com/tyremantra/worlds-most-valuable-tyre-brands-2018/>

Aside from Firestone, another major player in the industry is Salala Rubber Corporation (SRC), which was established in 1959 by the Liberian Agriculture Corporation (LAC) when the company signed a 70-year lease to develop 125,000 hectares of land. Today, SRC is the fourth largest rubber company in the country, not only harvesting rubber, but also operating a processing plant and exporting latex.⁷ The company currently runs under the auspices of Socfin which also owns Weala Rubber Company.

Overall, there are seven major concessions in Liberia, but three are owned by Socfin covering the three contiguous counties of Margibi, Bassa and Bong. That in combination with Firestone's huge concession in Margibi county, it is clear that rubber production is largely concentrated in the middle of the country which presents opportunities beyond production but also in services that create or capitalize off synergies like the transportation, warehousing, and centralized trade centers.

Rubber Rehabilitation

About seven and a half acres of rubber has the potential to earn \$500 per month when tapped (assuming adequate investments, efficient operations, and access to international markets).⁸ Given the 200,000 hectares (494,000 acres) of land covered by rubber trees in Liberia, this translates into \$32 million per month (nearly \$400 million per year) in potential gross income. This is a critical data point because without any value addition, presumably, Liberia could monetize this resource to benefit from much needed windfalls. The only way to fully optimize rubber plantations to be able to meet this milestone is by planting new trees and rehabilitating existing rubber plantations. However, rehabilitating rubber is labor intensive because tapping and most of the maintenance work (such as biannual brushing) cannot be mechanized. Also, a significant amount of labor is required to remove previous vegetation since agricultural burning is not advised due to the large volumes of CO₂ emission that get released into the atmosphere.

The large amounts of capital and labor required for rubber cultivation and rehabilitation go toward felling old trees (either by power saw or manual labor), freeing up planting lines, planting new trees, and brushing existing plantations to keep the vegetation between the trees under control. While it is possible to monetize old rubber wood by making charcoal, the onward burning of charcoal in cooking is seen as environmentally unfriendly and so this revenue source is not a key focus in the sector. That said, using rubber wood for furniture is a viable use of the felled trees and an avenue that can be explored to offset the costs associated with the rehabilitation. The time required to initiate the activity, bring unproductive rubber smallholder lands back into production, and provide a self-sustainable long-term income source is approximately seven years. Rejuvenated unproductive rubber smallholdings can provide significant long-term income for farmers.⁹

In Liberia, only 1% of irrigable land developed and agricultural production is generally characterized by poor productivity and low efficiency for all crops but notably low for rubber: 8 tons/ha (cassava); 2.5 tons/ha (crude palm oil); 1.5 tons/ha (rice); and 0.8 tons/ha (natural rubber). But ultimately, rubber is a profitable crop and well-suited to the climate and soil of Liberia. Rubber rehabilitation will enable companies to have access to substantial raw materials necessary to supply commercially viable operations that produce value added products demanded on world markets. It is through the rehabilitation of rubber plantations that significant protection of the biodiversity in the surrounding forests can be achieved, and massive economic windfalls can be tapped by investors and the GoL alike.

⁷ <https://www.scirp.org/journal/paperinformation.aspx?paperid=113985>

⁸ <https://www.rubberband.com/blog/facts-rubber-tree/>

⁹ https://www.land-links.org/wp-content/uploads/2018/04/USAID_Land_Tenure_PROSPER_Agriculture_Value_Chain_Assessment.pdf

Rubber Opportunities

1. Biodegradable Rubber Gloves

During the Covid-19 pandemic, demand for gloves worldwide surged over 100% for the first few months of 2020 to more than 200 billion pieces¹⁰. The global rubber gloves market was valued at \$34 billion in 2020, is anticipated to generate over \$120 billion by 2030 and is projected to experience a CAGR of 12% from 2021 to 2030¹¹, showing that even more aggressive growth is expected in the long-term versus the medium-term forecasts shown in Figure 10. The surge in global health consciousness after the most recent pandemic has led to an increase in the demand for disposable gloves for medical and household purposes. That said, the huge demand has not been limited to healthcare businesses but also skincare salons, barber shops, restaurants, supermarkets, airlines, hotels, repair workshops etc. To meet the surging demand and expand their capacities, glove manufacturers have added additional production lines. By type, powder free, disposable, latex gloves dominated in their respective market segments in 2020 (versus powdered, reusable gloves made of other materials) and are projected to continue to grow faster than their alternatives all the way up to 2030.

Figure 11. Global Gloves Market 2020-2024 Snapshot

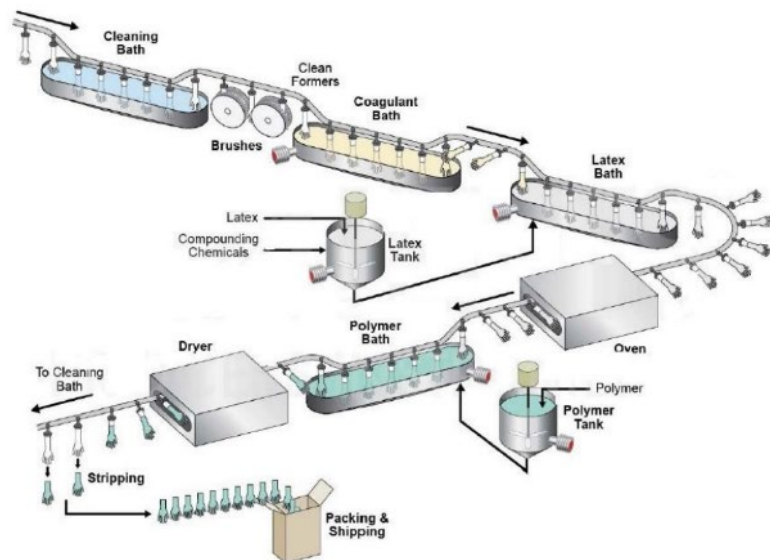


Source: Business Wire

Controversially, the nearly 80 million gloves used by COVID-19 health workers every month were made mostly of synthetic/nitrile rubber that are expected to stay in landfills for up to 100 years. So, with over 300 billion rubber gloves now being used each year - enough to fill New York City's landmark Empire State Building 25 times - Malaysia's

Meditech is poised to capture the fast-growing biodegradable gloves market. Not only does the company make natural rubber gloves that can biodegrade in one year or less and produce 30% less waste during production, its CEO has said that he is "prepared to share [the patent] with those who want [it]"^{12, 13}

Figure 2. Rubber Glove Making Flow Diagram



¹⁰ MARGMA (Malaysian Rubber Glove Manufacturers Association), 2020

¹¹ <https://centaur.reading.ac.uk/100629/1/61497e8fc191f.pdf>

¹² <https://www.weforum.org/agenda/2020/11/covid-19-prompts-pivot-to-green-alternative-to-rubber-gloves/>

¹³ http://www.msmedi-guwahati.gov.in/PDF/Project_profile_on_Rubber_Hand_Glove.pdf

Value Chain Analysis – Ministry of Agriculture Liberia - 2022

The annual average price of medical gloves imported into the US soared from \$0.56 for a dozen pairs in 2019 to \$1.77 in 2021. The price increases, combined with higher demand, saw the value of rubber glove imports to the US reach \$7 billion in 2021, up from just \$2.3 billion in 2020. By January 2021, a survey by Premier, a US healthcare group procurement organization with a membership of more than 4,000 hospitals and health systems, found that procuring exam gloves was second only to staffing issues as the biggest challenge in caring for covid patients.¹⁴

Chart 2. Price of Imported Rubber Gloves in the US

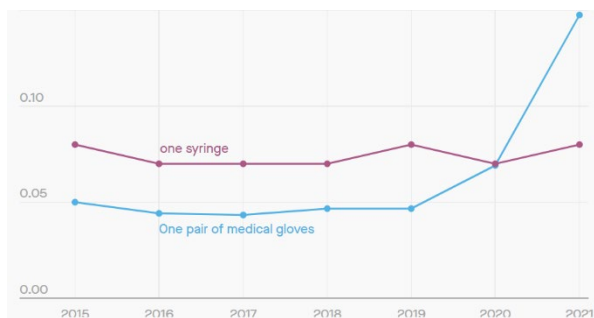
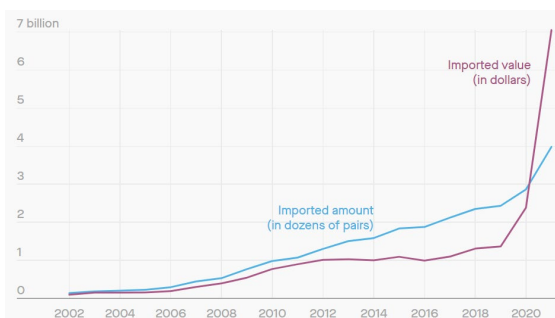
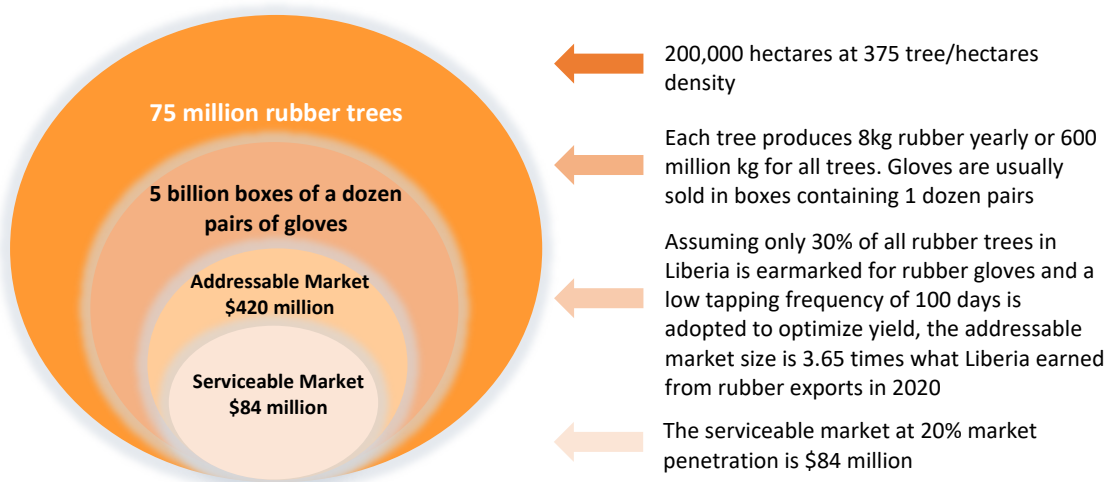


Chart 3. US Imports of Rubber Gloves



Therefore, Liberia could stand to benefit from at least two sides – (1) supplying companies like Meditech with export-ready rubber and (2) acquiring the technical know-how to produce commercially viable quantities of biodegradable natural rubber gloves in country to supply insatiable demand in places like the US market. With its 200,000 hectares of existing rubber plantations, Liberia could have over 75 million producing rubber trees across the country (considering the recommended planting density of 375 trees per hectare). Each healthy and well-managed rubber tree should be able to produce 8 kg of rubber per year which equates to up to 600 million kg of rubber for the 75 million possible rubber trees in Liberia. Using the estimate that each kilogram of rubber can produce 200 gloves and knowing that the average price of medical gloves imported into the US was \$0.56 for a dozen pairs the reasonable adjusted addressable market size for rubber gloves in Liberia is \$420 million.^{15, 16, 17} Conservatively, the serviceable market at 20% market penetration is \$84 million.

Figure 3. Rubber Gloves Market Sizing



¹⁴ <https://qz.com/2128295/a-monopoly-explains-why-rubber-gloves-prices-are-up/>

¹⁵ http://www.msmedi-chennai.gov.in/GARMS_Admin/basictools/images/Covidproject/Disposable-Latex-Gloves.pdf

¹⁶ <https://www.rubberband.com/blog/facts-rubber-tree/>

¹⁷ <https://www.britannica.com/science/rubber-chemical-compound/Tapping-and-coagulation>

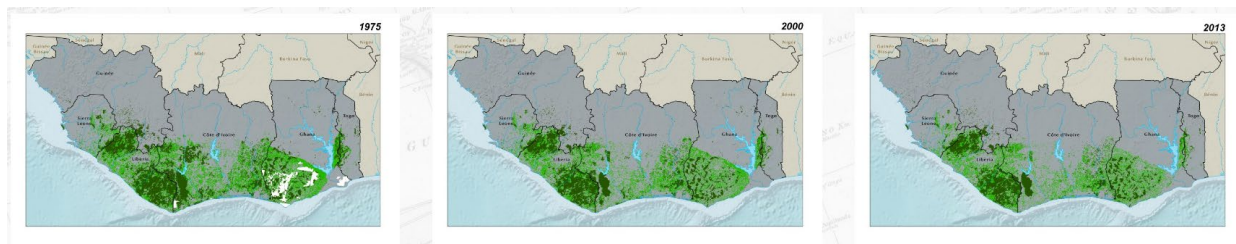
Value Chain Analysis – Ministry of Agriculture Liberia - 2022

This estimate showing underutilization aligns with the fact that neighboring Cote d'Ivoire, the largest rubber producer in Africa, planted around 550,000 hectares of rubber trees in 2020, nearly 3 times the volumes found in Liberia. Cote d'Ivoire is about three times the size in square kilometers of Liberia and earned about US\$1.3 billion in 2020. Therefore, if operating at comparably optimal levels, Liberia should have earned over US\$ 400 million from its rubber exports in 2020, instead the Liberia earned only US\$115 million. This logic combined with the model above indicates that the lack of focus on the sector, investments in concessions and privately held farms, and public-sector incentives left at least US\$ 300 million of potential export revenue on the table and out of the hands of the GoL and rubber companies.¹⁸

2. Carbon Credits – Carbon Sink

Climate change and biodiversity loss caused by an increase in the earth's temperature due to greenhouse gas emissions are some of the defining challenges the world faces today and one of the main sources to counter this change, the Amazon rainforest, is now emitting more carbon dioxide than it is absorbing.¹⁹ Rainforests are critical for managing climate change as they stock and absorb carbon dioxide and are home to more than 50% of terrestrial biodiversity, while only covering 6% of the Earth's surface.²⁰ The Guinean forests of West Africa rank fourth in world hotspots for intact area, rank first for animal biodiversity, and rank eighth in plant biodiversity. Therefore, the Guinean sub-region is of immense significance for biodiversity and carbon storage - Liberia sits entirely in the Upper Guinea sub-region of the West Africa Guinea Forest Zone. The country alone contains the largest carbon sink in Africa outside of the Congo Basin, and accounts for 43% of the remaining Upper Guinean Forest ecosystem.²¹ At the same time, Liberia faces the continued risk to its forestry due to both commercial and chainsaw logging; shifting cultivation; the clearing of forests for permanent agriculture; charcoal production; and rising urban and rural populations. With the continued growth in the use of carbon credits and the precedent set by Gabon as the first African country to receive results-based payments for reduced emissions from deforestation and forest degradation, Liberia is well positioned to benefit from its natural forest ecology.²²

Figure 4. The Importance of Liberia in the Upper Guinea Forest



¹⁸ <https://www.statista.com/statistics/1184220/natural-rubber-exports-value-from-liberia/>

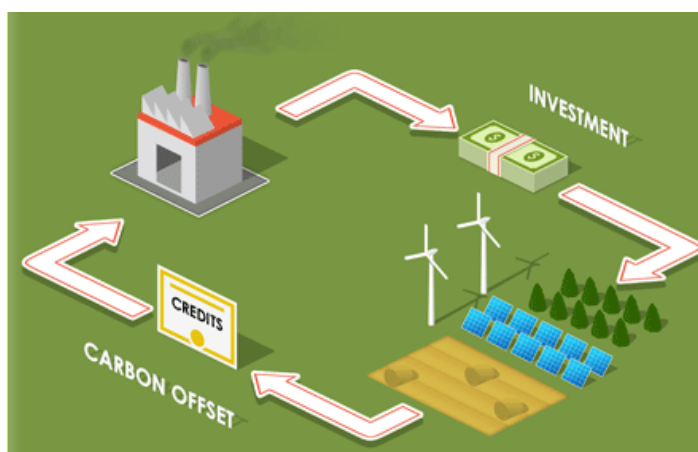
¹⁹ <https://www.devex.com/news/gabon-plans-to-become-a-green-superpower-by-harnessing-its-rainforest-101636#:~:text=On%20Sept.,Gabon%20to%20offset%20their%20emissions>

²⁰ <https://www.un.org/africarenewal/magazine/july-2021/gabon-becomes-first-african-country-receive-payment-reducing-co2-emissions>

²¹ https://www.profor.info/sites/profor.info/files/WAFS-draft-42111_0.pdf

²² <https://eros.usgs.gov/westafrica/land-cover/deforestation-upper-guinean-forest>

Figure 5. Carbon Credits Flowchart

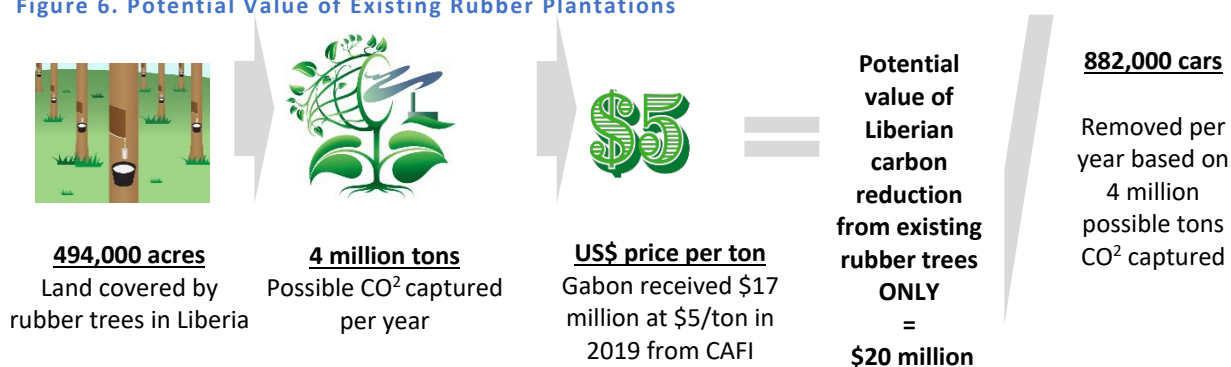


Carbon credits, are measurable, verifiable emission reductions from certified climate action projects that reduce, remove, or avoid GHG emissions. A carbon credit represents the right to emit one metric ton of carbon dioxide and can be exchanged in a carbon market voluntarily or as part of a regulatory framework. Essentially, large industrial companies must hold carbon credits proportional to its carbon emissions. If its emissions exceed the carbon credits allocated by its regulator, it must buy additional carbon credits on the carbon

market to offset its additional emissions; and this is how private capital can be directed to countries like Liberia if it can successfully create, regulate, and monetize its natural carbon sink.^{23, 24}

Market analyses show that global demand for carbon credits is surging as companies are in a race to offset their emissions, meanwhile countries are also striving hard to meet their emissions reduction targets. Countries and businesses are aiming to achieve net-zero emissions by 2050 (i.e. offsetting 100% of the carbon they emit) and for the same year, the BloombergNEF, a clean energy research group, expects the market for carbon credits to surpass \$500 billion.²⁵ The value of the global carbon credits market grew 20% in 2020 to reach \$270 billion. In 2020, the markets captured its fourth consecutive year of record growth, and the total market value is now 5x the value it was in 2017.²⁶ As of September 2021, a carbon credit trades for around \$16 per metric ton of carbon dioxide stored and as more businesses adopt net-zero goals, it is expected that the price of carbon offsets could increase by at least ten-fold in the next decade.²⁷ Rubber plantations act as carbon sinks – a one-hectare plantation captures 250 tons of carbon in 30 years.²⁸

Figure 6. Potential Value of Existing Rubber Plantations



²³ <https://medium.com/unleash-lab/carbon-credits-as-a-means-of-financing-development-projects-3245a5ebc1e2>

²⁴ <https://landgate.com/news/2021/09/27/what-are-carbon-credits-and-how-do-they-work/#:~:text=Can%20farmers%20sell%20carbon%20credits,of%20CO2%20their%20land%20sequesters>

²⁵ <https://carboncredits.com/bahamas-sell-blue-carbon-credits/>

²⁶ <https://tambonthongchai.com/2019/09/30/cer/>

²⁷ <https://landgate.com/news/2021/09/27/what-are-carbon-credits-and-how-do-they-work/#:~:text=Can%20farmers%20sell%20carbon%20credits,of%20CO2%20their%20land%20sequesters>

²⁸ World Wide Fund for Nature

4 Ways Liberia can earn from its carbon sink

1. Quantify the carbon sink of unused areas of forests and sell on voluntary carbon markets
2. Companies operating in the rubber industry in Liberia, to quantify CO₂ captured, earn carbon credits, and sell on voluntary markets – profit sharing with GoL
3. The GoL to lobby the United Nations to set up a facility like the Central African Forest Initiative (CAFI), the auspices under which Gabon was able to receive its first payment at \$5 per ton of carbon reduction for \$17 million in 2019, in West Africa
4. The GoL to concurrently establish a cap-and-trade system that would enable various rubber companies to trade carbon allowances to meet the government's carbon reduction objectives. The government would use the net carbon reduction among the trading companies to receive funding from international agencies that could be partially redistributed to domestically operating companies, through tax or other allowances, for example.

Key Takeaways

The estimated combined serviceable value of these industries given the current availability of rubber trees planted across Liberia is over \$100 million clearly illustrating that Liberia is sitting on grossly underproducing assets. From an investor's standpoint, considering Liberia for the manufacturing of rubber gloves means tapping into huge reserves of readily available latex in a market that is very close to the second and third largest rubber surgical gloves markets in the world (United Kingdom, \$202 million and Germany, \$227million).²⁹ In addition, these companies would also be able to capitalize off the \$20 million, and growing, carbon sink capabilities of Liberia. Attracting investors and achieving these milestones means the GoL needs to promote a carbon credits industry by introducing landmark legislation to regulate carbon credits in a user-friendly way for companies.

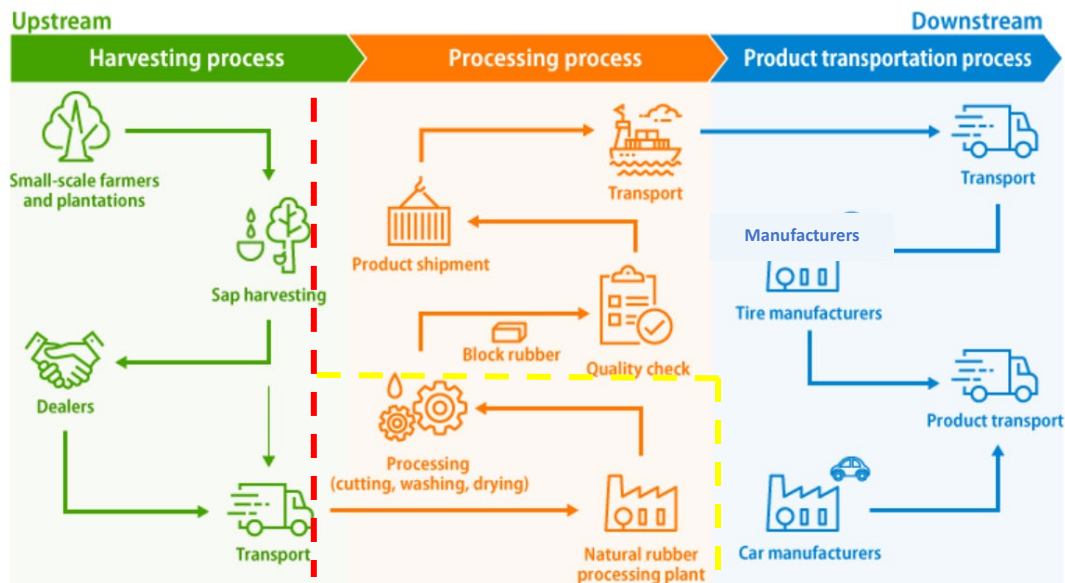
Investment Impact:

- Increase in jobs due to the opening of rubber gloves factories and labor-intensive plantation rehabilitation initiatives
- New carbon credit monitoring and monetizing capabilities will create jobs and new skillsets
- Quantifiable positive impact on climate change due to forestry management
- Acquisition and transition into skilled-labor force through the introduction of rubber gloves factories

²⁹ <https://oec.world/en/profile/hs/rubber-surgical-gloves>

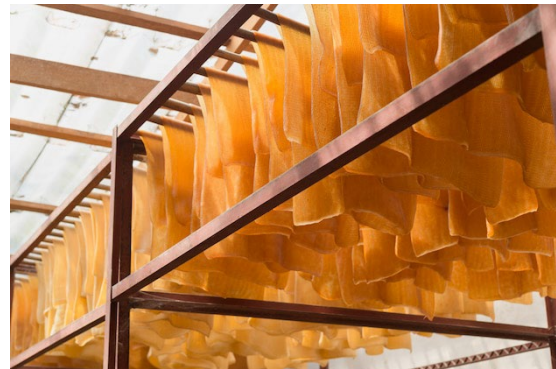
Rubber Value Chain

Figure 7. Rubber Value Chain



In Liberia, the rubber value chain has been dominated by upstream activities, namely harvesting. A large number of small-scale farmers supply a small number of foreign concession companies, the largest being Firestone - the country's principal buyer of smallholder produce. These international companies have been known to dictate the specification of the product they will accept (Firestone only accepts cup lump - solidified raw rubber) and the price they will offer, clearly exploiting the imbalance of economic power that has repeatedly caused farmers to struggle to break even. In recent years, the sector has begun to transition into midstream activities (yellow dotted line) having been

introduced to Ribbed Smoked Sheets (RSS), a semi-processed molded wet sheet rubber product made of latex collected from the farms and imported chemicals. These sheets are passed through a roller and processed overnight in a smokehouse in a relatively low-cost process, the output of which is a ready-for-export product that international manufacturers transform into finished goods such as tires and footwear. While farmers in Liberia are typically offered \$500 for a ton of cup lump, buyers in Thailand pay over \$1,700 for the same quantity of RSS.³⁰ Even though there is only one RSS processing facility operating in Liberia, RSS should be used as a gateway for the Liberian rubber industry to evolve beyond harvesting into processing and eventually transportation/exportation. This is a clear illustration that the true value to Liberian rubber sector stakeholders is in the midstream and downstream verticals of the value chain.³¹



³⁰ <https://www.growliberia.com/insights/rubber/rss-how-rubber-processing-is-bringing-profit-to-an-ailing-industry>

³¹ <https://www.y-yokohama.com/global/csr/rubber/what/>

Rubber SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Substantial and sustainable demand due to the myriad industries it supplies, such as medical and healthcare, hotel, restaurants, airlines, manufacturing • Rubber gloves for medical and healthcare purpose cannot be substituted with other glove materials because they have a virus and bacteria protection coat • Sufficient land acres for new factories • No shortage of workers 	<ul style="list-style-type: none"> • New trees take 7 years to harvest • Feedstock required to make rubber products need to be imported • Labor intensive production • Limited financial support from government • Very limited existing midstream market for goods and services 	<ul style="list-style-type: none"> • Carbon credits sales • High job creation potential • Import substitution • Many large MNCs with strong financial positions and cutting edge technologies interested in expansion • Large growth in many subsectors • Expand sales and business models to digital platforms for direct sales • Increase demand for natural versus synthetic rubber products 	<ul style="list-style-type: none"> • Pressure from international organizations to reduce felling rubber trees • Illegal logging • Increasing demand for products that can be made with synthetic rubber