Amazon Forest Products

The Amazon region is rich with regenerative agriculture and wild forest products. Some are global commodities, while others have yet to be fully discovered by international markets. To help educate potential buyers, this report offers profiles of 15 of the region’s most promising species whose increased production and consumption can sustain new economic cycles that protect and regenerate forests. More information is available about diverse Amazonian products in our commercially viable Amazonian species wiki.

Species profiles:

Açaí
Babassu
Brazil nuts
Breu branco
Cacao
Camu-camu
Copaíba
Cupuaçu
Guaranã
Jaborandi
Jatobá
Murumuru
Pirarucu
Tambaqui
Ucuuba
Açaí, the fruit of an Amazon palm tree, has won over the world. It is the star of snack bars in coastal cities of Brazil, in kiosks in Los Angeles and New York (USA) and even in Paris (France). Açaí, typical of the Amazon region, is the fruit of the açaizeiro (Euterpe oleracea and E. precatoria, Palmae family) and is widely used by local Amazonians in the preparation of juices, wines, sweets, liqueurs, and ice cream. The açaizeiro is a typically tropical palm, found in its wild state and is part of the vegetation of the forests of terra firme, várzea and igapô. The palm is also exploited in the region for heart-of-palm extraction. Known for having a pulp with great nutritional power, the fruit is consumed worldwide in drinks, fruit mixes, ice cream, and capsules.

In the Amazon region, the juice made from the pulp is known as "açaí wine." Generally consumed with tapioca flour, it is part of the local diet. Today, the Brazilian state that leads production is Pará, occupying almost 90% of the national market. Açaí is enjoyed throughout the region and recently has also been consumed in the Southern and South Eastern states of Brazil, especially by athletes.

Brazil accounts for about 85% of the world's açaí production, with an average of 1.5 million tons produced annually between 2015 and 2020. In 2020, the national production was 1.7 million tons, almost 5% more than the previous year, according to the National Supply Company (Conab), linked to the Ministry of Agriculture, Livestock and Supply.

There are about 212,000 hectares dedicated to growing açaí on terra firme or floodplain areas, according to Conab. According to the Federation of Industries of the State of Pará (Fiepa), between 2011 and 2020, exports of açaí in Brazil increased by almost 15,000%. From about 40 tons in 2011, the country's exports
reached 5,363 tons in 2020, less than 1% of the total harvest. Pará accounted for 94% of shipments, generating about US$ 13.2 million (R$ 68.7 million). In all, the state went from a production of 756.4 thousand tons in 2010 to 1.3 million in 2019.

The rapid increase in açaí cultivation to match increased demand has been dubbed "açaization." Most of the production, especially in the floodplain regions, is in the hands of riverbank and farming families. While wild-harvested açaí dominated the market for most of the past 20 years, cultivated açaí now accounts for about 85% of Brazilian production. The harvest is sold locally as fruit and sent to the rest of the world, including Brazil, in the form of pulp, the source ingredient of various products. Currently, there are 118 industries in Pará dedicated to processing açaí. Some have their own cultivation, but many still depend on the riverside dwellers' production to maintain their supply.
The babassu palm is produced in the Amazon and has international distribution. It occurs in terra firme areas in Western Amazonia and more frequently in deforested areas of primary forest. It is a slow growing monocotyledon palm. It has a base protected by persistent leaf sheaths and it propagates by seeds. When young, the tree produces ovoid fruit with pointed tips and a persistent calyx at the base, measuring 9 cm to 10 cm in diameter.

The plant produces an average of four clusters with 330 fruits, weighing about 28 kilograms. The almond is consumed raw and the fruits are used for flour, charcoal, and snack food. Babassu oil and powder are extracted from the fruits, and the leaves are used for teas, dyes, and handicrafts. The trunk is commonly used in house construction in certain regions, while buds can yield hearts-of-palm.

Widely used in cooking, green babassu almonds provide a milk with nutritional properties similar to human milk. Flour extracted from the mesocarp is called babassu powder. It is highly nutritious, is used as a food supplement, and is sometimes an ingredient in cakes and porridge. It is anti-inflammatory, analgesic, rich in fiber, and used as a remedy for constipation, colitis, and obesity because it helps to improve intestinal efficiency.

The primary use of babassu almonds is the production of babassu coconut oil, which is widely used in the cosmetic, food, soap, detergent, and lubricant industries. The oil is also a common part of the diet in the Amazonia and Cerrado regions. Almond extraction is traditionally an in-home process, conducted by local populations and “coconut breakers.” Babassu oil also has a low iodine concentration and a high
saponification value, the highest among vegetable oils used by industry. The endocarp can be used to make charcoal, while the hard shell can be used to produce gas fuels, ethanol, methanol, coke, reactivated charcoal, acetic acid, and tar - all of which have significant industrial applications.
Among the most commonly used plant resources of Amazonian biodiversity is the Brazil nut tree, Bertolethia excelsa H. B. K. Native to the Amazon, the tree can be found in Bolivia, Brazil, Colombia, Ecuador, the Guyanas, Peru, and Venezuela. In the Brazilian states, the tree is found in Acre, Amapá, Amazonas, Pará, Rondônia and Roraima. Although the Brazil nut tree produces hedgehogs (spiky seeds), bark, and wood for various uses, its almonds are of great economic importance to local Amazonian wild-harvest communities.

Native to the Amazon, the nut is recommended in diets due to its antioxidants and high protein content. The wild-harvest production of the Brazil nut requires the application of best practices to meet the quality standards of both national industries and the international market. To export the product, there is zero tolerance for the presence of aflatoxins, substances produced by fungi naturally present on the forest floor. The global market is estimated to be valued at $240 million per year, with a total of 31,000 metric tons exported to international markets.
Breu-branco resin oil can be obtained from several species of Protium, also popularly known as almecega or almescla. Most frequently, it is a resin exuded from the trunk of the Amazonian tree Protium heptaphyllum. It belongs to the burseraceae family. The tree can be found in various regions of Brazil, but only where there is well-preserved native forest. Because it does not tolerate deforestation it can be considered a bio-indicator of the conservation status of the environment. In addition, its fruits are covered with a sweet, white mass that attracts birds and other dispersing animals.

The indigenous people and Amazonian riverside dwellers regard it as a sacred resin, used in ceremonies and healing rituals to drive away evil spirits and cure physical problems. The Brazilian Army, during the training of soldiers in survival courses, suggests using breu-branco rosin not only as a natural repellent, but also as an easily combustible material to start a fire.

In its solid form, the rosin is traditionally used to caulk boats, due to its large amount of terpenes. In phytotherapy, the resin is used to treat venereal diseases, as the oil has anti-inflammatory and analgesic effects as well as antipruritic properties, indicated for use in boils and abscesses. Due to its aromatic qualities the resin is widely used in perfumery and toiletries, such as perfumes, colognes and soaps. One chemical component, limonene, can be used as a flavoring agent in food manufacturing.
Cacao (Theobroma cacao) is a typical fruit from the Amazon basin and the tropical Americas, growing wild from Peru to Mexico. Roasted cacao beans become cocoa. Known mainly for being the raw material in chocolate, cocoa has many other uses. The butters and oils are used in the cosmetic and pharmaceutical industries. It is possible to produce cocoa honey as well from the pressed pulp, but a dozen beans are needed to extract the sap, thus making the product little known in the market.

The white pulp that surrounds the beans is the main ingredient used in cacao juice, yogurt, jellies, mousses, puddings, ice cream, and distillates. It is even fermented as wine and vinegar. After the fruit is broken, the peel can be used for the production of organic fertilizer or animal feed.

In Brazil, cocoa cultivation was introduced in Pará, in the Amazon region. Currently the crop covers an area of 618 thousand hectares in the country, and produces a crop of 270 thousand tons. A study by Embrapa demonstrated how the sustainable expansion of cacao production has been beneficial to the Amazon by integrating job creation with forest preservation. In Para, the largest producer of cacao in Brazil, 70% of the cultivation is done in degraded areas, mostly by family farmers in agroforestry systems. Formerly cattle pasture, these areas have recovered and are now more resistant to fire and experience less deforestation.
**Camu-camu** is a typical fruit of the Amazon region. It grows on the banks of rivers, mainly in the flood season, covering parts of Colombia, Venezuela, Peru and Brazil. Camu-camu fruit is considered to be the richest natural source of vitamin C in Brazil, besides being an important source of antioxidants, β-carotene, phenolic compounds, and minerals such as potassium, iron, calcium, and phosphorus. It is also a good source of select amino acids such as serine, valine, and leucine. The fruit is sour and astringent. It is mostly consumed in the form of ice cream, jellies, liqueurs, and jams. Despite its high nutritional value, it is little known in Brazil, but it is already widely used in other countries. Japan and the European Union are the main export markets for camu-camu products, such as pulp, extract, and juice. In addition, the fruit is also widely used in the pharmaceutical industry, mainly due to its high content of vitamin C and antioxidant agents.

The consumption of camu-camu provides the following health benefits:

- Strengthening the immune system
- Acting as an anti-inflammatory
- Fighting the flu and the cold
- Decreasing the risk of oxidative stress and cellular damage
- Preventing premature aging
- Possibly helping to control blood pressure
- Possibly helping to control blood glucose

In Brazil, it is grown mainly in Pará, Amazonas, and São Paulo. Peru is a large producer and exporter of the fruit to the US, Europe and Japan, despite limited use at home.
Copaiba or "cupa-yba" is a word from the indigenous language Tupi, meaning "deposit tree," referring to the significant deposits of oil in the plant. It is also called copaíva or copahu by the people of the region. Due to its many medicinal uses, copaiba oil is considered to be a panacea and is called a "miracle tree", as one of the most used medicinal plants in the Amazon.

The plant has dozens of different medicinal properties that have been scientifically proven. Among other characteristics, it is antimicrobial, anti-inflammatory, and anti-neoplastic - used to destroy malignant cells and prevent the growth or spread of cancerous tumors. Recent studies have also shown great potential for the use of copaiba oil in dentistry. Amazonians also use copaiba oil to combat and treat tonsillitis and the inflammation of the throat. It also acts on hives, dermatitis, acnes, and insect bites.

Copaiba oil-resin is extracted from the stem of the plant through a pipe. After extraction, the hole is sealed to prevent termites and other insects from entering. When good management practices are followed, resin oil extraction is sustainable because trees can rest and regenerate. There are no definitive studies on the time required for a copaiba tree to recompose the extracted oil. The volume per tree varies from 0.3 to 3 liters, depending on the species and various conditions.

The copaiba tree lives in an ecosystem composed of other species, other trees that are companions to it. In other words, where copaiba is managed, there is a standing forest.
Cupuaçu (Theobroma grandiflorum) is an Amazonian fruit, belonging to the sterculiaeae family and to the same genus as cacao. Cupuaçu is a medium-sized tree native to the Amazon. The nutritious fruit and its creamy white pulp are highly appreciated throughout the Amazon region. It is part of the local cuisine, is found in local markets, and is a common ingredient in juices, candies, cakes, pies, ice cream and other creams and desserts. Recently the pulp has been used by the cosmetic industry as an ingredient in skin creams and shampoos.

Cupuaçu is known in the Amazon as "the pharmacy in a fruit." It contains unique polyphenols and many powerful antioxidants such as essential fatty acids, amino acids, fiber, and phosphorus as well as vitamins A, B1, B2, B3 and C. Cupuaçu stimulates the immune system while strengthening the body's ability to fight disease. It is one of the few plants in the cocoa family that has an energizing effect and contains no caffeine. Besides benefiting the immune system, cupuaçu can lower blood pressure, increase libido, lower LDL cholesterol (bad cholesterol), and even provide many benefits for skin and hair health.

In 2018, the Brazilian state of Pará produced more than 27,000 tons of cupuaçu from 8.5 thousand hectares in production, with an average yield of 3200 kg per hectare. The northeastern mesoregion of the state is responsible for half of this production, with the remainder distributed among the other mesoregions. The microregion of Tomé-Açu is regarded as the main center of cupuaçu production,
producing 32% of the total harvest in the state. Most of this production comes from Japanese-Brazilian farmers working together in a cooperative in the municipality of Tomé-Açu where they conduct production and processing.
If there is one fruit that can be considered representative of Brazil, it is guaraná. Although it is also found in Venezuela, it was in the Brazilian Amazon that it proliferated to the point of becoming a cultural reference. Guaraná, a shrub from the Sapindaceae family, is very common in the states of Amazonas and Pará. The small, red fruits of guaraná grow in bunches. It is known locally as naranazeiro, uaraná, guaranaúva, and guaranaína. The first contact with guaraná (Paullinia Cupana) was reported in 1669 by the indigenous Andirá people. In 1775, the Maués people were already famous for making a drink made of guaraná and, at the end of the 18th century, the first studies on guaraná culture were made.

Some of the medicinal properties of guarana include:

- Energy and cognitive enhancement: Guarana is a natural stimulant that can help to increase energy levels and improve cognitive function, including memory and focus.
- Weight loss: Guarana has been shown to increase metabolism and fat burning, which may help with weight loss when combined with a healthy diet and exercise.
- Anti-inflammatory: Guarana contains compounds such as catechins and procyanidins that have anti-inflammatory properties and may help to reduce inflammation in the body.
- Antioxidant: Guarana is rich in antioxidants, which can help to protect the body against oxidative stress and prevent cellular damage.
- Pain relief: Guarana has been used in traditional medicine to relieve pain and headaches.
- Digestive health: Guarana may have a positive effect on digestive health and has been traditionally used to treat diarrhea and constipation.
Guaraná was first exported in 1852, destined for Europe. In 1907, the first guaraná factory was created in Manaus, operating until the 1970s. Due to the popularity of the fruit, the Antarctica Paulista company was launched in 1921 to sell the first soft drink made with guaraná.

In 1961, the first commercial “guaranazeiro” vine was planted outside the Amazon biome in Bahia, Brazil. In the decade following, Antarctica created the first “guaranazeiro” plantation in the Amazonian municipality of Maués. In the 1980s, the guaraná industry expanded and the Amazonas state government financed the production of 100,000 “guaranazeiro” seedlings that were cultivated by stake rooting. By 1982, the systems for cultivating guaraná were regulated by the Ministry of Agriculture and Manaus launched a national guaraná development program.

By the 1990s, there was international demand with two tons of organic guaraná exported in 1995. In 1999, the International Masters Franchising Agreement was signed, paving the way for guaraná exports to more than 175 countries. In 2001, Brazil exported 21 tons of an açaí-and-guaraná energy drink to the United States. By 2006, the genetic code of the plant was sequenced, and in 2011, guaraná clones (BRS Cerêaporanga, BRS Mundurucânia, BRS Luzéia and BRS Andirá) were launched that were capable of producing an average of 1.5 kg of dry seed per plant.
For the last three decades, *jaborandi* has been one of the most important commercial species of native Brazilian flora. It is the only natural source of the drug pilocarpine, an alkaloid used in ophthalmology for pupil contraction which is necessary for certain eye-surgery procedures. Jaborandi is also used in the treatment of glaucoma.

Pilocarpine is a powerful salivation and perspiration stimulant. In 1994, it was approved by the US Food and Drug Administration (FDA) for the treatment of post-irradiation xerostomia in head and neck cancer patients.

The primary center of jaborandi leaf production, in Brazil, is the state of Maranhão, which produces about 95% of plants that are harvested. Despite the importance of jaborandi for human health and the Amazonian communities that produce it, the plant is now threatened with extinction due to the encroachment of livestock and commercial agriculture into the ecologically sensitive areas where the plant grows.
In the indigenous language Tupi, Jatobá means hard-shelled fruit. Scientifically known as Hymenaea courbaril, jatobá occurs in parts of South and Central America, from Mexico to Paraguay. As a tree it is found more frequently in poor, clayey soils, and grows in late secondary and climax forests. In Brazil, it is easy to find it in all regions of the country.

As a food for humans and animals, the fruit is four times richer in potassium than the banana, but with equal energy content. Jatobá wood is used for heavy construction, props, beams, flooring, car bodies, and furniture. The bark provides a resin that is used to manufacture varnish.

In popular medicine the sap is used to treat coughs and bronchitis. Tea made from the bark is used to combat stomach problems and to treat athlete's foot and foot fungus. Finally, the resin is also used to treat upper respiratory and cardiopulmonary problems.
Murumuru is a plant found throughout the Amazon region. It grows in low, moist soil in clumps with 10 to 15 m high stems, measuring 17 - 27 cm in diameter, as a monocot with persistent sheaths forming plates covered with long black spines up to 12 cm long. The sweet, yellow fruit has a pyramidal shape, is oleaginous, and tastes like ripe melon. The seeds are dispersed by river water and animals such as the paca, jabuti, monkey, peccary, etc.

Murumuru oil is obtained by pressing the seeds or almonds in a type of equipment known as a cage press or expeller. The leading Brazilian cosmetics company, Natura, studied Murumuru and scientifically proved that its butter helps to repair hair. The plant has several properties that make it beneficial for use in cosmetics and personal care products, including:

- Moisturizing: Murumuru butter is highly moisturizing, and is effective at restoring moisture to dry or damaged skin and hair.
- Emollient: It is a highly effective emollient, which means that it helps to soften and soothe the skin and hair, making it feel smoother and more supple.
- Nourishing: It is rich in essential fatty acids and antioxidants, which help to nourish and protect the skin and hair from damage caused by environmental stressors.
- Anti-inflammatory: Murumuru butter has anti-inflammatory properties that help to soothe and calm irritated skin, making it an excellent ingredient for use in products designed for sensitive or reactive skin.
- Non-greasy: Despite its highly emollient properties, murumuru butter is easily absorbed into the skin and hair, without leaving a greasy or oily residue.
- Sustainable: Murumuru butter is a sustainable ingredient, as it is harvested from the seeds of the murumuru palm tree, which is native to the Amazon rainforest, and is a valuable resource for the local communities who depend on it for their livelihoods.
Pirarucu (Arapaima)

As one of the largest freshwater fish species in the world, the pirarucu, also called arapaima, may become important for the future of Brazilian aquaculture, due to its hardiness, fast growth and clear filet, with an absence of bones and a mild flavor. Despite this potential, its production is still modest due to a series of technological limitations.

Several aspects of pirarucu biology have attracted the interest of fish farmers including its need for breathing air and its ability to quickly and efficiently convert feed to body mass development. The pirarucu stands out for its rapid growth reaching 1.70 m and 80 kg at 6 or 7 years of age, but with the possibility of reaching 3 m and 200 kg. Breeding pirarucu could present an opportunity to harmonize the goals of sustainable resource management and poverty alleviation.

Pirarucu meat is sold fresh, frozen and salted, while the head is used in the preparation of typical regional dishes. Other body parts are highly valued as well. The skin or “leather,” for example, is used by the fashion industry for apparel as well as for finishes in luxury vehicles and aircrafts. The process of structuring the fish’s commercial supply chain, however, still has some challenges related to captive breeding, transportation, and cold chain integrity.

According to the UN Food and Agriculture Organization (FAO), pirarucu market studies carried out in Peru indicate wide acceptance of the fish, especially in international markets where it is given gourmet status and can attract higher prices. In the absence of proper market conditions for processing and distribution, the fish however is condemned to commercialization in the local markets, where it competes with other dynamics.
The lack of proper production capacity is cited as one of the primary reasons why pirarucu consumption is limited in Brazil, in addition to the lack of slaughterhouses. On the other hand, there are numerous opportunities to generate employment and income with pirarucu by-products, including the production of protein hydrolysate and flour. Other opportunities include developing smoked products and making technological improvements that process the fish for nuggets, hamburgers, and other ready-made dishes.

Pirarucu is the flagship species of community managed floodplain fisheries.
- It is the largest scaled fish in the world, growing up to 3 meters and weigh 200 kilograms.
- The fish have few bones and large filets the length of the fish.
- Since early in the colonial period dried salted pirarucu (filets or "mantas") was a staple of Amazon trade, an important source of animal protein for urban and rural populations, called the "Bacalhau" of the Amazon species.
- By the 1990s, it was depleted to the point of being placed on Cites List 2 of endangered species.

Researchers at the Mamirauá Sustainable Development Reserve in Tefé developed a highly effective system for managing pirarucu based on a system for estimating the pirarucu populations of individual lakes. Teams of trained fishermen can spread evenly across a lake and systematically count individual fish when they come up to the surface to breathe in their zone over a set period. With this method, teams of fishermen from communities can accurately estimate the size of the pirarucu population in their lakes, the number of juveniles and adults, and can then define a quota that enables the population to continue to grow, while quotas increase and the number of pirarucu fisherman also increases.

In certain Amazon regions, sustainable fishing strategies for the pirarucu were put in place 20 years ago. Fishing according to quotas can only be done from July to November, during the non-mating season. Since the start of these programs the pirarucu population has soared in some areas, from more than 2,500 in 1999 to more than 190,000 in 2019. Such sustainable fishing efforts help to reinforce the autonomy and identity of traditional communities.

Today, more than a hundred traditional and indigenous communities are involved in sustainably managing pirarucu and other species in community lakes. The success comes from the dissemination of this system and its implementation and regulation by state government policy. The fish population is recovering and the numbers of traditional and indigenous communities managing pirarucu have increased by 425% in twenty years. These fisheries management strategies have been used in Brazil, Bolivia, Peru and the Guyanas.

Strategically increasing demand for pirarucu and fair trade price controls are keys to future market development. The Taste of the Amazon Initiative, operated by Operation Native Amazon (OPAN), has positioned chefs as important stakeholders in the pirarucu chain, as ambassadors for the fish and influencers that bring it to consumers. The Rural Producers Association of Carauri (ASPROC) and chefs together have helped to achieve fair prices. Fishermen are paid R$7/kg (about $1.75) by the association vs just R$4/kg in local markets, while restaurants offer more, paying R$48/kg because of transportation costs.
The tambaqui is a medium sized (up to 15kg in the wild), deep bodied, fruit-and-nut eating omnivore that migrates seasonally between floodplain lakes and main river channels. The fish’s lifestyle is similar to that of many other species who also feed on fruits and nuts in floodplain forests during the annual flood. The tambaqui is also the most popular food fish in the Amazon, though overfishing has led to the depletion of wild stocks.

Since 2006, Amazon aquaculture has prioritized the production of native species. Tambaqui has become the chief product of regional aquaculturists, representing up to 80-90% of production in some states. Today, the supply of the farm-raised fish has outpaced the supply of those caught in the wild, now serving as the primary source of tambaqui in traditional fish markets of the region. The total annual aquaculture production in Amazonian states is estimated to be around 180-200,000 tons, almost all of which is consumed locally.

Amazon aquaculture is practiced at multiple levels. Today, most aquaculture producers are small-to-medium scale farmers. In some areas, even traditional and Indigenous communities are investing in aquaculture production. In the state of Rondônia, support from the government and low beef-production incomes, inspired a large-scale shift from beef to fish. For a time Rondônia was the largest aquaculture producer in the country and is still among the top 3.

Amazon aquaculture may be one of the best ways to reduce Amazon deforestation. Aquaculture production can produce the same amount of animal protein as beef production, but on just 5% of the land. By investing in aquaculture instead of beef, Amazonian farmers could significantly reduce the drive for deforestation.
How could the introduction of tambaqui to international markets help to drive an economic shift in the region? The numbers are simple. Fish is the highest volume animal protein source that is traded globally. In 2020, beef exports generated $52.6 billion in revenue while fish exports generated $146.5 billion. Global demand for Amazonian fish could catalyze a large-scale economic move away from cattle ranching and toward forest-friendly aquaculture production. To achieve such a goal, several innovations are needed to help scale tambaqui cultivation. Production systems can be modernized for more effective water quality monitoring and circulation. In addition, modern cuts of Amazon fish could be developed to attract new customers. There is a rich Amazonian culinary tradition with numerous recipes for preparing and consuming tambaqui.

To realize all of the opportunities presented here, the primary challenge now is developing modern but locally appropriate supply chain infrastructure and market demand for the growing volume of tambaqui and other Amazonian fish.
Ucuuba is an endangered Amazonian tree that grows in humid areas and is frequently sought after for its light, clear wood. Those who cut it down, however, may not realize that most of its value comes from its seeds, a source of natural butters that facilitate deep skin repair. Ucuuba fruits are used for the production of cosmetics, perfumes, and candles. Ucuuba butter provides intense hydration and a smooth texture to all skin types, even the driest. It also has the benefit of not leaving the skin greasy.

Ucuuba wood stands out for its quality. It is used for the production of plywood and laminates. A prime target of legal and illegal deforestation, the species at risk of extinction.

In ucuuba plantations of up to 150 trees per hectare, approximately 7000 kilos of seeds are harvested each year, offering yields of 3500 kg of fat per hectare. One kilo of dry seed can yield up to 50% of its weight in oils and fats, surpassing the quality of bovine products by several measures. This quality makes ucuuba an ideal candidate for replacing animal tallow in soaps and other oleochemical industry products.