

**Rainforest Resources**

**Teachers’ Pack**

This pack is designed to give teachers an indication of the species and subjects that will be discussed during the Rainforest Resources tour, as well as some further background information on our exhibits.

This tour will look at all the resources that we humans get from rainforests across the world. It will look at a wide range of resources including food, woods, oils, waxes and medicines. The tour will examine the ways that both indigenous peoples and the developed world use rainforests. It will also look at the ways in which many of these resources are used in the everyday lives of people in the U.K.

Background information

What is a resource

For the purpose of this tour, a resource can be defined as something naturally occurring to which human society attaches some value due to its usefulness. Different cultures use resources in different ways and this is an important factor to consider when talking about a resource - how is it useful and to whom?

The resources included in this pack are all naturally occurring resources; however, as with all natural resources, the available supply is affected by our use. The rainforests of the world contain many resources that can be found nowhere else in such great abundance, and some cannot be found anywhere else on Earth. The global demand for many of these resources is high, and, as many of the nations where these resources are found have large foreign debt, the financial incentive to exploit these natural resources is high and is often done with little thought as to the long term effects.

National Curriculum

Citizenship

KS3:

* the roles played by public institutions and voluntary groups in society, and the ways in which citizens work together to improve their communities, including opportunities to participate in school-based activities

KS4:

* local, regional and international governance and the United Kingdom’s relations with the rest of Europe, the Commonwealth, the United Nations and the wider world
* human rights and international law
* the different ways in which a citizen can contribute to the improvement of his or her community, to include the opportunity to participate actively in community volunteering, as well as other forms of responsible activity

Geography

KS2-

* locate the world’s countries, using maps to focus on Europe (including the location of Russia) and North and South America, concentrating on their environmental regions, key physical and human characteristics, countries, and major cities
* human geography, including types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water

KS3- Human and physical geography:

* human geography relating to: population and urbanisation; international development; economic activity in the primary, secondary, tertiary and quaternary sectors; and the use of natural resources
* understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on the effective functioning of natural systems

Science

KS2 Biology

* recognise that environments can change and that this can sometimes pose dangers to living things.

KS3 Biology

* the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere
* the interdependence of organisms in an ecosystem, including food webs and insect-pollinated crops

KS4 Biology

* positive and negative human interactions with ecosystems.

**The Tour**

**Lowlands**

Poison dart frogs

Poison dart frogs are used by Colombia's Embera tribe and by the Choco people of western Colombia to aid them in hunting. The Golden dart frog is the species most commonly used and the toxins are extracted from the frog’s skin by ‘sweating’ it. This is done in many different ways, but generally involves heating the animal. Once the frog begins to ‘sweat’, a white foam appears on the frog’s skin into which the darts are then dipped. The poison can last on the dart for up to a year.

Over the past decade, scientists in the U.S. have discovered 500 new compounds within the poison of dart frogs, some of which are being studied for potential medicinal use. One such compound, developed into a painkiller, is ABT-59, which is 200 times stronger than morphine, but is not shown to be addictive. These pumiliotoxins (a type of neurotoxin found in the skin) typically come from the frogs’ diet of alkaloid-containing insects, such as ants.

Vanilla

Vanillas are the only orchids that produce an agriculturally valuable crop, and 95% of the world's traded vanilla pods are derived from just one species. The Totonac tribe of Mexico is credited with being the first to use vanilla as a flavouring, possibly over a thousand years ago. Though being native to Mexico, vanilla is now cultivated and exported mainly from Madagascar, Reunion, Tahiti and Indonesia. Vanilla is now the second most expensive spice after saffron due to it being a highly labour-intensive crop, as vanilla’s natural pollinators do not exist outside the plant's native range. Even within that range, vanilla orchids have only a 1% chance of successful pollination. As a result, all vanilla grown today is pollinated by hand, this is a time-consuming process which cannot always meet global demand, so a synthetic version was made called vanillin. Now around 1% of vanilla flavourings are made from actual vanilla, the rest comes from vanillin.

**Small Islands**

Pencil Cactus

The pencil cactus isn’t a true cactus, but a succulent. It has been naturalised in a wide area of the tropics. It is normally found in dry bushland thickets and is easily grown in open woodland and grassland up to elevations of 2,000m. A report from the late 70s and 80s made the case for pencil cactus to be used a bio-fuel. The latex from the plant, which is an irritant to humans, contains petroleum-like hydrocarbons. Once processed, it yields high octane gasoline. With an average yield of 4 to 8 barrels of oil per hectare, it is estimated that the fuel would be three times cheaper than crude oil to produce. The pencil cactus’s preferred habitat is in barren areas where grass and other plants struggle to grow, including areas where the rainforest has been previous felled. The crop could therefore be commercially grown in areas that have been degraded, or land that has little other commercial use. Pencil cactus could also be used in reforestation programmes, as is currently being done in Tanzania.

Mangroves

Mangroves are trees or shrubs that live along sheltered coastlines within the tropic or subtropic latitudes. There are many different species, which all share the unique capability of growing within the reach of the tides in salty soil. Some of them grow so close to the shore that they are flooded with salt water every day. All mangroves have evolved special adaptations that enable them to live in salty, oxygen-poor soil. Mangroves provide wood for buliding houses, furniture, fences, bridges, fishing poles, canoes, rafts and boats. Charcoal made from mangroves is highly prized in Japan. The bark of mangrove trees is high in tannins and is used in the process of tanning animal hides to make leather. Other products that are produced from mangrove species include soaps, cosmetics, perfumes and insecticides. Mangroves are also an important ecological resource, as they play an important role in coastal defence. They are vital in protecting the vulnerable coastline from storms and tsunamis by absorbing the power of the waves. It is estimated that mangrove ecosystem services are worth $33-57 thousand per hectare per year to the national economies of the developing countries where they are found.

**Amazonica**

Agriculture- Cattle Ranching (toucan)

Almost all species of toucan are in population decline due to loss of habitat. This includes the Channel billed toucan whose primary threat is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching. Cattle ranching is the largest driver of deforestation in every Amazon country, accounting for 80% of current deforestation rates. Brazil is home to approximately 200 million head of cattle and is the largest exporter in the world, supplying about one-quarter of the global market.

Banana

The banana palm is actually a herbaceous plant, which produces a large flower spike forming bunches of 50-100 fruits and dies after fruiting. Bananas do not grow from seeds, but from bulbs or rhizomes, the flower appears in the sixth or seventh month of growth and it takes 9 to 12 months from planting a banana bulb to harvesting the fruit. Unlike some fruit, which have a growing season, bananas are available all year round and are the fourth largest food crop in the world. It is a staple food in tropical countries but also a vital export crop. Bananas are also used as feed for livestock. The flowers are used in salads and stir-fries in South-East Asia.

Cocoa Tree

The edible properties of the Cocoa tree were discovered over 2,000 years ago by the local people of its native Central America. In the years 2008-2009, world cocoa production was 3,515,000 tonnes.

Cocoa solids and cocoa butter are used to make chocolate, which is not just a foodstuff, there is evidence that suggests that eating between 46 and 105g of plain chocolate a day can have a moderate effect on lowering blood pressure. It is not just the finished product that has health benefits, unfermented cocoa seeds and the seed coats are used to treat a variety of ailments including diabetes, digestive and chest complaints. The crushed shells of cocoa beans can be used as an alternative to peat mulch, which can be layered on to the soil surface to suppress weeds, conserve moisture, improve its visual appearance and minimise erosion.

Madagascar Rosy Periwinkle

The Madagascar rosy periwinkle is a popular ornamental plant found in gardens and homes across warmer parts of the world. In traditional medicine, the rosy periwinkle has been used to treat a variety of ailments both in Madagascar and in other parts of the world where the plant has naturalised.

In the 1950s, its use in traditional medicine brought the plant to the attention of scientists from the developed world and it was by chance that they discovered its startling effect on white blood cells in animals, which were significantly reduced— exactly the action required for treating leukaemia. Two very important cancer-fighting compounds are found in the leaves of the plant, although in tiny amounts - Vincristine and Vinblastine.

Black Pepper

Fruits of the pepper plant are loosely arranged and go dark red when fully ripe. Red, green, black and white peppercorns are all the same part of the plant: red is the mature seed, green is the immature seed, black has been dried and white has had the skin removed. This plant is one of the world's most widely and frequently used spices. Black pepper is also used to produce pepper oil (the oleoresin), which is frequently used in the production of convenience foods and sometimes also for perfumery. In modern medicine, compound**s** contained in black peppercorns called alkaloids are used in various treatments, for example, piperine, which is reported to act as a central nervous system depressant and to have anti-fever, pain-relieving, anti-inflammatory and insecticidal effects.

Coffee

There are over 120 species of coffee plants in the world. However, the coffee we drink comes from two species, *Coffea arabica* (commonly known as Arabica) which accounts for 60-80% of the world’s coffee production and *Coffea canephora* (commonly known as Robusta) which accounts for the other 20-40% of the trade. Coffee is considered to be one of the most important commercial crops and the second most traded commodity after oil. With around 20 million coffee farming families and around 100 million people depending on coffee for their livelihood, it is easy to see why it is such an important crop.

Coffee wood from the main trunk is used locally in construction. This is because this wood is straight, dense, strong and partially resistant to termites, which make is an ideal building material. It can also be used to make furniture.

Ginger

Ginger is used as a food source in several ways depending on the part of the world. In Asia, the fresh stem and rhizome (a modified stem) is an essential ingredient of many dishes, whereas the dried, powdered spice is more popular in European cooking. Gingerbread, ginger biscuits and ginger beer are the most popular uses of ginger in Britain. In modern medicine, ginger has been proven to prevent nausea and vomiting in motion sickness. Ginger can also be used in adults to treat other symptoms of mild complaints affecting the stomach or gut.

In herbal medicine, the fresh or dried rhizome is used in oral or topical preparations to treat a variety of ailments, such as flatulence and other gastrointestinal problems, fever, cough, colds, congestion of the chest and cramp. Ginger can also be made into an essential oil that can be applied topically as pain relief.

Rubber Tree

First discovered by the ancient Olmec, Maya, and Aztec people of South America, the latex sap from the rubber tree is still used in the modern processing of rubber and is often a substantial source of income for indigenous populations. It is used in making tyres, industrial conveyor belts, condoms, surgical gloves, sporting equipment, shoes, sportswear and in a wide range of parts for bicycles, cars, motorcycles and other machinery and as an additive in the chemical industry.

Bamboo

There are thousands of different species of bamboo and within these species can be found some of the fastest-growing plants in the world. Certain species of bamboo can grow 91cm in 24 hours, at a rate of almost 4cm an hour. It is a very useful plant as it is very lightweight but still incredibly strong. These characteristics mean it is used by over half the world’s population for an incredible variety of things ranging from constructing skyscrapers to making rulers. especially in South and East Asia and the South Pacific, where its uses range from constructing skyscrapers to making rulers. In recent yearsthere has been more emphasis on using bamboo as a sustainable alternative in a range of products from toothbrushes**,** to clothes and fabrics. Products made from bamboo are often fully bio-degradable and so are often marketed as being better for the environment. Bamboo itself can absorb five times more carbon dioxide and produces 35% more oxygen than than many other types of tree and as it is fast-growing it can often be cultivated without harmful chemicals.

Snakes

The trade in snake-skin is extremely lucrative: it is estimated that half a million python skins are exported annually from South East Asia in a trade worth $1bn (£625m) a year. The EU, led by Italy, is the world's biggest importer of reptile skins, buying £69 million worth in 2005. The viper, *Bothrops jararaca*, often called ‘Fer-De-Lance’ because of the distinguishing lance-like head, is found across Argentina, Brazil, and Paraguay A bite from *B. jararaca* often results in the victim’s collapse due to a massive drop in blood pressure. Scientists worked out how the venom causes blood pressure to decrease and exactly which chemical in the venom is responsible. This chemical was synthesised and made into a medication to reduce blood pressure to non-damaging levels, which may help the one billion people worldwide who have high blood pressure.

Sloths

Sloths are arboreal mammals that are well known for being slow movers. There are six species across two families of sloth: two-toed and three-toed. In the lowland forest of Panama, three-toed sloths can be found that have a large number of algae and bacteria growing in their fur. Scientists have tested these micro-organisms and discovered some which are able to fight the parasites that cause malaria (*Plasmodium falciparum*) and Chagas disease (*Trypanosoma cruzi*), and have some effect against the human breast cancer cell line MCF-7.

Fifty fungal extracts were tested and of them, twenty were active against at least one bacterial strain.

Gold Mining (Tambaqui)

In the Amazon, more than 50 thousand hectares of land is currently being used for mining, that’s over 93 thousand football fields!

In the Amazon basin, most mining today revolves around alluvial gold deposits. Mercury is used to help separate the gold from the soil but it is a highly toxic pollutant, affecting the nervous system. In the vicinity of gold extraction sites, mercury can be found in high concentrations in fish which then enter the food chain and affect local populations. 90% of fish caught by rural villagers south of gold mining areas of the Tapajós River in Brazil were found to be contaminated with methyl mercury2.

**When not on Tour**

Either before or after your guided tour, depending on which time slot you have booked, you will be able to take your pupils into the rainforest in small, supervised groups. This is a good opportunity to complete the tour-specific worksheets (available for you to download from our website) or to spend time looking in more depth at some of the plants and animals. There are many good opportunities for both artwork and creative writing.

When not on tour, we ask that your groups give way to the groups who are on a guided tour and give them priority at exhibits.

If you have any queries about this tour, please contact the education department.

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