CLIMATE SOLUTIONS

This ancient material is displacing plastics and creating a billion-dollar industry

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CORUCHE, Portugal — The rhythmic noise of axes whacking trees echoes in the depths of the cork oak forest.

But in Coruche, a rural area south of the Tagus River known as Portugal's "cork capital," the bang of trees falling to the ground doesn't follow the sound of the ax strokes. Instead, experienced workers carefully peel away the bark from the tree trunks.

This annual rite of extracting cork in the summer months has been around for thousands of years in the western Mediterranean. Egyptians, Persians, Greeks and Romans used the material to make fishing gear, sandals and to seal jugs, jars and barrels. As glass bottles gained popularity in the 18th century, cork became the preferred sealant because it is durable, waterproof, light and pliable.

Now cork is experiencing a revival as more industries look for sustainable alternatives to plastic and other materials derived from fossil fuels. The bark is now used for flooring and furniture, to make shoes and clothes and as insulation in homes and electric cars. Portugal's exports reached an all-time high of 670 million euro ($728 million) in the first half of 2023.

But cork is more than a trendy green material. In addition to jobs, the forests where it grows provide food and shelter for animals, all while sequestering carbon dioxide. And unlike most trees grown commercially, cork oaks are never cut down, meaning their carbon storage capacity continues through the 200 years or more they live.

How cork is harvested

With a firm swing, Fernando Tacha strikes the trunk of a cork oak, then twists his ax and uses the handle to delicately prise the plank.

“I started cutting cork when I was only 19. Now I’m 69. But I will do this as long as I can,” he says as he wipes the sweat from his forehead. “It’s a hard job, but a beautiful one.”

A low, slow-growing evergreen tree, the cork oak is endemic to the Mediterranean. The most extensive forests can be found on the Atlantic coast of the Iberian Peninsula. In Portugal, the world’s largest cork producer, the oaks are so cherished they were chosen as the country’s national tree and are protected by law, so it’s forbidden to cut them. Spain is the second-largest producer, followed by Morocco, Algeria, Tunisia, Italy and France.

The process of harvesting cork takes precision and years of practice. The stroke of the ax must be strong, but also delicate to avoid hitting the inner bark and damaging the tree. Because it is so specialized, it’s one of the best paying agricultural jobs in Portugal.

The bark can only be harvested between late May and August, when the tree is in its active phase of growth, which makes it easier to strip the outer layer without damaging the tree trunk.

The cork oak is unique in its ability to regenerate its bark. Once it is removed, workers write the last number of that year with white paint on the exposed golden brown trunk — a three means it was harvested in 2023. The bark will slowly grow back and be ready for another harvest after nine years.

“The tree always regenerates,” says forest engineer Conceição Santos Silva.

Paula Salgueira, who has been working in the cork harvest in Coruche for 35 years, extends her hand to touch an oak that was just stripped. “It’s cold,” she says as she caresses the smooth denuded trunk. While axmen work in pairs removing the cork, Salgueira and a few other women gather the planks in piles for transportation.

The planks will then be stacked outdoors in storage areas exposed to air and sunlight. After six months of aging to remove moisture, they will be sorted according to their thickness and quality, then boiled to clean impurities and make the material softer and easier to handle.

From bottle stopper to green material

While most cork is still used for bottle stoppers, over the last decade different industries have been finding new uses for it.

“We are seeing a growing interest in cork as a sustainable material,” says Rui Novais, a materials expert at the University of Aveiro in Portugal. “Compared with materials like polyurethane foam [used for thermal insulation], products made with cork require less energy and produce less CO_2 emissions.”

The cork oak’s thick bark adapted to defend the tree from fire, making it a powerful insulating material that’s been used to shield fuel tanks on NASA spacecraft and electric car batteries. It’s also resistant to water and oil, and can withstand compression while retaining springiness.

“It’s an extraordinary, renewable and biodegradable material,” says Novais. “It’s also very durable. It has been demonstrated that cork products remain virtually unchanged for more than 50 years.”

Part of the carbon absorbed by cork oak trees is transferred to cork products, which can be used for long periods, repurposed and recycled. Several studies found that cork is carbon negative, meaning it can store more carbon than what is required to produce it.

When cork planks are trimmed and punched to form natural cork stoppers, the leftovers are ground into granules and pressed together to form cork sheets or blocks. “Even cork dust is used to produce energy,” says João Rui Ferreira, secretary general of the Portuguese Cork Association. “It feeds the industry’s boilers and powers some of the production.”

Recycled cork can also be crushed and composited to make other products. In Portugal, Green Cork, a recycling program started by the environmental organization Quercus, has collected and recycled more than 100 million cork stoppers since 2009. A similar initiative, ReCORK, exists in the United States.

A natural factory

Most of the cork produced in Portugal grows in the gently undulating hills and plains in the south of the country, in an ancient agroforestry system known as montado. This savannah-like ecosystem combines cork, holm oaks and olive trees with pastures, grazing livestock, crops and fallows.

“The soil in southern Portugal is very poor, there is very little rain and temperatures are very high in the summer,” says Teresa Pinto-Correia, a professor at the University of Évora in Portugal specializing in rural landscapes and agricultural systems. “But this kind of system is productive even when resources are scarce and conditions are difficult.”

For centuries, locals have preserved the montado because cork provided landowners with a source of income. This mosaic of habitats supports hundreds of species, including the Iberian lynx, the world’s most endangered wildcat, and the threatened Imperial eagle. One of the world’s oldest known cork oak trees, planted in 1783 in Águas de Moura, is known as “the whistler” because so many birds visit its large sprawling branches.

Iberian pigs feed on acorns and goats graze the interwoven pastures. Interspersing cork oak trees with animals and crops can boost production and biodiversity, but also build soil, control erosion, retain water, combat desertification and sequester carbon, says Pinto-Correia.

While the cork forests can help mitigate the effects of climate change, they are also increasingly at risk from it as drought and wildfires become more intense and more frequent in the region.

“The tree is adapted to the Mediterranean climate. The bark protects it from fire,” says Santos Silva. “But for the first two years after cork is extracted, the trees are much more vulnerable to wildfires because they don’t have this protection.”

Yet fires in cork groves, she says, remain rare because of careful human management.

As a slow-growing tree, the cork oak takes decades to provide shade and produce good quality cork. But in Coruche, people still go by an old Portuguese saying: “Those who care about their grandchildren plant cork oak trees.”

This story has been updated.