



Tracking down illegal timber

Researchers are hoping a new method of DNA analysis gives them a weapon in the battle against illegal felling. It enables them to establish precisely where timber comes from. 'That has never been seen before.'

TEXT RENÉ DIDDE PHOTO BRENT STIRTON/GETTY



The large-scale illegal felling of tropical forests has been a concern for at least 30 years. All those years, people have been shuddering at images of growling chainsaws felling huge 100-year-old trees and robbing monkeys and colourful fauna of their homes. And yet things have not been put right. There are countries such as Indonesia where as much as 70 percent of the wood on the market was felled illegally, shows a British report by Chatham House. Cameroon, the Democratic Republic of the Congo and the neighbouring Congo-Brazzaville are in the top five high-risk countries with more than 50 percent illegal wood.

The European Union is trying to combat the trade in illegal timber with the EU Timber Regulation that has been in force since 2013. 'The success of the European timber regulation depends entirely on effective enforcement,' says Arjan Alkema, deputy director of FSC Netherlands. FSC is one of the labels aiming at promoting trade in timber from sustainably managed forests. 'But it is only on paper, and there are massive financial interests at stake. Legal and illegal consignments can get mixed up, people can fiddle the paperwork, and many EU countries don't take enforcement of the regulation very seriously. Spain only allocated staff to policing this in 2016.'

ESTABLISHING ORIGINS

There may be a glimmer of hope. Researchers at Wageningen University & Research developed a genetic method for establishing the origins of wood. 'We used and improved on existing DNA techniques,' says head researcher Pieter Zuidema of the Forest Ecology and Forest Management chair group. The forest ecologist, who has a long track record in sustainable forest management and environmentally responsible felling, has been working with a team on this research for over two years. They are focusing on tali, a common and commercially popular tree species from West Africa. Tali is solid hardwood and is used for parquet floors and lintels, as well as for heavy outdoor structures such as bridges and waterworks. The researchers collected over 300 samples from five different timber concessions in Cameroon and Congo-Brazzaville, and isolated DNA from them. They obtained a unique DNA profile for each timber sample.

In a blind test using the DNA method on 12 new samples of tali, genetic ecologist Arjen de Groot of Wageningen Economic Research was able to trace the exact source of the wood in 11 cases. 'There was one I couldn't place and I was sweating when I reported that to the team,' says De Groot. 'It turned out they had deliberately put in one sample of tali wood from a totally different concession in the Congo.' >

This genetic method can locate the origin of timber to the nearest 14 kilometres. 'This has never been seen before,' says Zuidema. 'We can trace the wood right to the concession.'

'If we create a database with the most popular tropical wood species from the main timber concessions, or alternatively from the areas where most of the illegal felling goes on,' adds Zuidema, 'then we can find out whether a piece of timber comes from that area. I think we would then be able to provide evidence that would stand up in court.' Much-traded species such as tali, and the similar azobe in Africa, as well as teak, merbau and meranti in South East Asia, and cedar in South and Central America, should be the first in line when putting together a database, says Zuidema.

LEGAL STATUS

Setting up a database for the whole distribution area of every tree species is a time-consuming job. And an expensive one. 'It is not the actual establishment of the genetic profile that is costly,' explains Arjen de

'If we create a database, we can provide evidence that would probably stand up in court'

DEFORESTATION

Between 2010 and 2015, as much as 8.8 million hectares of forest was lost to legal felling every year, show figures from the FAO. Most of this was clearing for farmland, but there was also legal felling on plantations, where the forest as a whole survived.

On top of this, big consignments of timber that was felled without a license are traded on the market. There are no figures on this. 'So wood from trees that are felled to make way for soya and oil palm plantations can still be legally traded,' says Arjan Alkema, deputy director of FSC Netherlands. 'That wood competes with genuinely sustainable wood.' FSC wants to promote the trade in wood from demonstrably sustainably managed forest through a strict system of certification.

Groot. 'We've got the equipment and the software ready.' The difficulty lies more in obtaining good samples, delivered by independent scientists or staff at amenable companies. 'To arrive at a global system with a legal status, the procedures at laboratories have to be standardized and we must collaborate with others in universities specializing in such analyses, especially in Germany, Australia and the US, and in commercial firms,' says Zuidema. 'And that can be difficult because scientists only want to share that kind of data once they have published their findings. And commercial firms make their living from their databases.' Also, the different universities work on different species of wood.

But FSC's Alkema still sees the use of building up a database with money and participation from the timber industry. 'At FSC we are working ourselves on taking samples in the 1500 concessions certified by us, so as to make a contribution to a DNA database.' To this end, FSC works with Kew Gardens (the Royal Institute of Botanical Gardens in Britain) in forests in Central America.

PLANKS AND PANELS

'We think the genetic fingerprint is highly promising. We do think it's a disadvantage that you need living matter from the leaf or the cambium, the tissue that makes the tree grow larger in diameter. What we really want to know is where does the wood come from that is processed into planks, panels and paper. If you are unlucky, there is no more DNA to be found in those.' So FSC thinks that wood anatomy, mass spectrometry and isotope research can also be useful for tracing the species and the global origin of wood. The easiest of these is the wood anatomy, using microscopes to try and identify the species and origin of wood. Mass spectrometry is a cheap technique with which the chemical composition of wood and its source at the level of country and region can be established. The analysis of isotopes – chemically identical substances such as oxygen atoms, which can vary regionally in the number of neutrons in the atom nucleus – can make it possible to pinpoint the source even more precisely, down to the local level.

Pieter Zuidema and Arjen de Groot confirm that the DNA analysis works best with living cambium material. 'But in this project we have directed a lot of efforts precisely at improving on the feasibility of extracting DNA from the core wood. With tali, that delivers really usable results,' says De Groot. 'We also did chemical origins analyses with isotopes but those results for tali were not usable enough,' adds Zuidema. 'Isotopes of trees growing next to each other can be more different than those on different concessions. That meant we couldn't trace the wood



Timber from sustainably managed forests is stamped with the FSC logo.

to its precise source adequately.'

And of course, adds Zuidema, it takes a long time to establish solid databases. 'But the procedure for certification, checking documents, visiting concession holders, sawmills and transporters is a time-consuming and expensive job too.'

AT RISK

Zuidema is working on a proposal for follow-up research. 'We want to make a start on a database of the places where the most-traded wood comes from. Preferably, that would also cover the ecologically endangered zones in the high-risk countries.'

If that is a bridge too far, perhaps because the researchers are at risk in those regions, Arjen de Groot has another approach up his sleeve. 'If the lack of a database for the sensitive regions means we cannot say exactly where the wood comes from, at least we can confirm that possibly illegal wood does not come from the area mentioned on the label. We can do that because we have all the data on the bona fide areas. So with the confidence of Sherlock Holmes, we can say, 'you are trying to take me for a ride, old fellow.' ■

www.wur.eu/illegalhardwood

DNA ANALYSIS

The new Wageningen method for establishing the origin of wood works with existing DNA techniques which were adapted and improved. The researchers study the coding of junk DNA that was already present in wood samples. Mutations often appear in this DNA, changing its characteristic base pair pattern. Precisely those observed variations in the codes combine to form a unique profile: a genetic passport with which you can identify the tree, and ideally also the area where it grew. In future the method will become even more precise, expects genetic ecologist Arjen de Groot. 'Then we'll be able to look, not just at 10 places in the DNA, but at a thousand.' Eventually it will then be possible to analyse where that tropical hardwood chair from the garden centre came from, even if it has been treated with a stain or some other chemical stuff, says De Groot. De Groot thinks the NWWA (which supervises the import and export of wood), Customs and the certifying agencies will be able to work with the method.